

Division

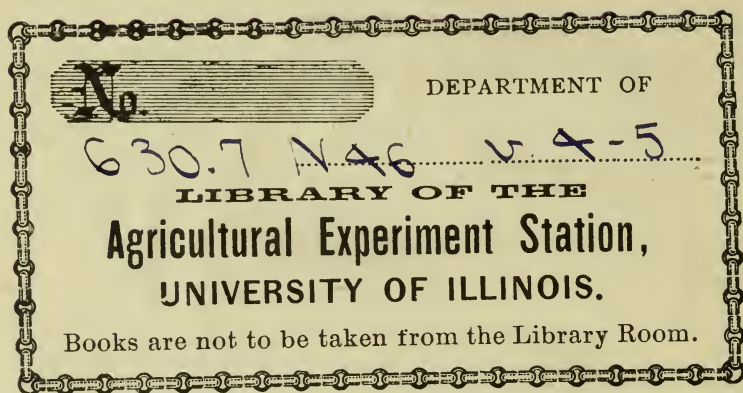
V.

Shelf

4.

Number

4.





Digitized by the Internet Archive
in 2014



FOURTH ANNUAL REPORT

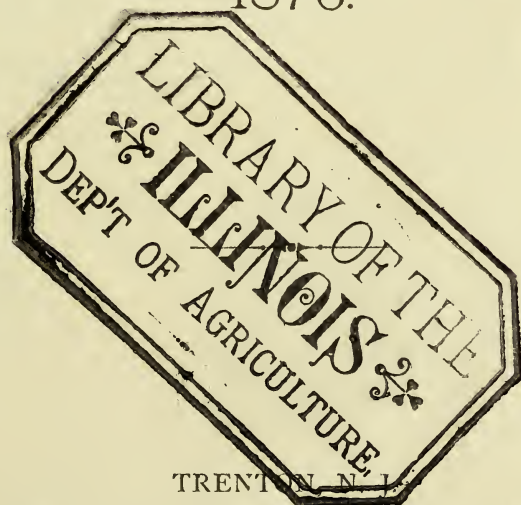
OF THE

NEW JERSEY

State Board of Agriculture,

FOR THE YEAR

1876.



TRENTON, N. J.

JOHN L. MURPHY, STATE GAZETTE PRINTING HOUSE.

1877.

OFFICERS OF THE BOARD.

PRESIDENT.

HON. WM. A. NEWELL.....Allentown

SECRETARY.

GEO. H. COOK.....New Brunswick

EXECUTIVE COMMITTEE.

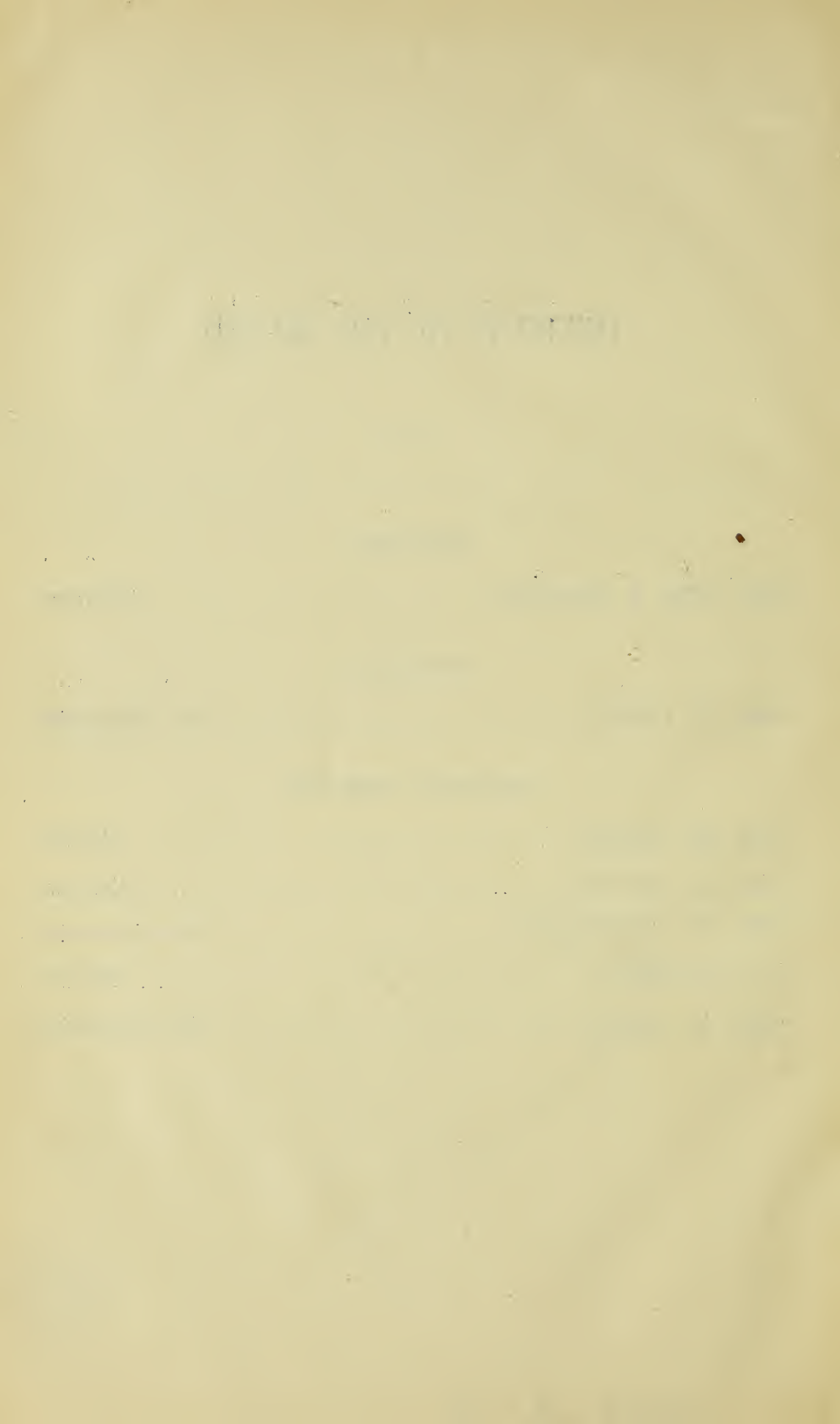
WM. M. FORCE.....Newark

WM. A. NEWELL.....Allentown

GEO. W. ATHERTON.....New Brunswick

P. T. QUINN.....Newark

GEO. H. COOKNew Brunswick



ORGANIZATION.

THE NEW JERSEY STATE BOARD OF AGRICULTURE is organized under Chapter DXLVI, of the laws of 1872, of which the following is a copy :

AN ACT TO ORGANIZE AND ESTABLISH A STATE BOARD OF AGRICULTURE.

WHEREAS, The National Agricultural Convention, at its late meeting in Washington, in taking action for the promotion of agricultural interests, resolved that the several States in which Boards of Agriculture do not now exist, be requested to organize such Boards by legislative action; *and, whereas*, such a Board, in the proper exercise of its functions, would become the centre about which to collect the results of successful farming, and from which to send out digested information in regard to the great questions of farm economy, tillage, crops, stock, fertilizers, reclamation of lands, training of farmers, etc.; therefore,

1. BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey*, That the Board of Managers and Superintendent of the State Geological Survey; the President and two of the Professors of the State Agricultural College, chosen by the College Faculty; three members of the Board of Visitors of the Agricultural College, chosen by their Board; the President or other representative sent by each of the State and County Agricultural Societies that may be in correspondence with this Board, shall constitute the State Board of Agriculture.

2. *And be it enacted*, That the members of the Board shall hold office for three years, or until their successors are appointed; except that of the first appointments the members shall be classed in three divisions, one-third of which shall retire from office in one year; one-third in two years; and the remaining third in three years; the vacancies thus occurring shall be filled in the same way the first appointments were made; other vacancies which may occur shall be filled in the same way, but only for the completion of the term in which they occur.

3. *And be it enacted*, That the Board shall meet at the State House, in Trenton, at least once in each year, and as much oftener as may be judged expedient; no member thereof shall receive compensation from the State, except for personal expenses when engaged in the duties of the Board.

4. *And be it enacted*, That the Board may appoint their secretary and prescribe his duties; he shall receive a salary not to exceed two hundred dollars a year, and may, with the approval of the Board, employ a clerk or clerks, at an expense of not more than one hundred dollars per year, which salary and expense shall be paid out of the Treasury of the State.

5. *And be it enacted*, That the Board may investigate such subjects relating to the improvements of land and agriculture in this State as they may think proper, and may take, hold in trust, and exercise control over donations or bequests made to them for promoting scientific education, or the general interests of agriculture.

6. *And be it enacted*, That they shall prescribe forms for and regulate returns of the agricultural societies of the State in correspondence with them, and shall furnish said societies with proper blanks, so as to secure uniform and reliable statistics.

7. *And be it enacted*, That they shall annually, on or before the second Tuesday of January, by their Chairman or Secretary, submit to the Legislature a detailed report of their doings, with such recommendations and suggestions as the interests in their charge may require.

8. *And be it enacted*, That the Secretary of the Board shall cause to be made and published for distribution as full an abstract of the returns of the agricultural societies as he judges to be useful.

Approved, April 4, 1872.

The Board held its first meeting at the College Farm, New Brunswick, September 4th, 1872, and effected a permanent organization by the election of His Excellency, Governor Joel Parker, President, and Professor George H. Cook, Secretary.

The second meeting of the Board was held at Trenton, March 5th, 1873, when the following By-Laws, reported by a committee previously appointed for that purpose, were adopted :

BY-LAWS FOR THE GOVERNMENT OF THE NEW JERSEY STATE BOARD
OF AGRICULTURE.

1. The officers of the Board shall be a President and Secretary, who shall be chosen each year, at the regular annual meeting, in Trenton, and shall serve until their successors are elected.

2. Besides the regular annual meeting of the Board, at Trenton, two meetings at least shall be held each year—one in the spring, and one in the early autumn. The President may at any time call special meetings of the Board; and he shall do so whenever requested in writing by any five active members.

3. The Standing Committee of the Board shall be as follows :

A Committee of three on the Culture of Staple Crops.

A Committee of three on Horticulture and Floriculture.

A Committee of three on Forest Culture.

A Committee of three on Diseases of Cattle.

A Committee of three on Legislation ; and such other committees as the Board may from time to time appoint.

4. All standing committees shall be chosen by ballot at the annual meeting of the Board. Special committees may be appointed at any time.

5. The duties of all committees, except the Executive Committee and Visiting Committee, shall be purely advisory.

6. The Board may from time to time elect Honorary Corresponding Members ; *provided*, that all nominations for such membership shall be made in writing by an active member of the Board, and passed upon by the Executive Committee previous to any election by the Board ; and any election to be valid must be unanimous.

7. Honorary Corresponding Members may be appointed to serve on any standing or special committee of the Board, and shall be entitled to all the privileges of active members, except the right to vote.

8. The order of business at the meetings of the Board shall be as follows :

I. Reading of minutes of previous meeting.

II. Reports of standing committees.

III. Reports of special committees.

IV. Unfinished business.

V. New business, including the reception of communications from other bodies.

9. The Executive Committee of the Board shall consist of five members ; one from the Board of Managers of the State Geological Survey ; one from the Board of Visitors of the State Agricultural College ; one from the Faculty of the State Agricultural College ; one from the Societies in correspondence with the Board ; and the Secretary of the Board, who shall be *ex officio* a member of the Executive Committee, and its Secretary.

10. The Executive Committee shall be appointed by the Board each year, at its regular annual meeting, in Trenton. It shall elect its own Chairman, adopt its own rules of procedure, and meet as often as its business may require.

11. It shall be the duty of the Executive Committee to prepare business for all meetings of the Board ; to arrange the time and place of public meetings of the Board, and to provide speakers, papers, &c., for the same ; to consider what legislation may be necessary from time to time for the promotion of the agricultural interests of the State ; to prepare and transmit to the Legislature the annual report required by law ; to fill vacancies that may occur in the office of President or Secretary, or in any committee, subject to the confirmation of the Board at its next meeting ; to maintain communication with similar bodies in other States, and with corresponding members or societies in the State of New Jersey ; and to do whatever else, subject to the revision of the Board, may be necessary and proper to carry out the purposes for which the Board is organized.

12. The Secretary of the Board, in addition to the duties usually belonging to that office, shall also act as Treasurer, and he may employ a clerk, as authorized by law.

13. These By-Laws, or any of them, may be suspended at any meeting by vote of a majority of the active members present. They may be altered or amended, notice having been given at least one meeting previous.

14. In the order of business the report of the Executive Committee shall follow immediately after the reading of the minutes. Passed 26th February, 1876.

At the same meeting a paper was read by the Secretary, setting forth the nature of the work undertaken by the Board. It was unanimously approved, and ordered to be entered in the minutes of the Board as an authorized statement of its aims and duties. The following is a copy :

“The Board of Agriculture finds its duties in investigating and recording whatever concerns the agricultural interests of New Jersey.

“Its investigations should include all facts relating to the various soils of the State ; their chemical and mechanical condition ; their productiveness and susceptibility of improvement ; their means of access to the cheapest and best natural or artificial fertilizers ; their adaptability to crops and fertilizers ; the best methods of rearing, improving and fattening stock, including the prevention and eradication of all forms of disease among them ; they should include, also, the examination of new implements, and processes of working the soil, and the best methods of drainage ; the economy of farm management as applied to market gardening, farming or forestry ; the proper laying out of a farm into pasture, meadow, tilled land and woods ; the location, construction and economy of farm buildings and fences ; the methods and principles of beautifying rural homes ; and the consideration of what legislation may be needed to secure the interests of farmers.

“It is no part of its work to exhibit farm products, stock or implements, but, on the contrary, it seeks to maintain communication with all Societies, Associations and Clubs organized for such purposes within the State ; to gather from them the results of their observations and experiments, and to furnish them in return results obtained from other Societies, or digested material drawn from a comparison of the whole of the results together.

“It should make its investigations and results useful to the whole State, by printing and distributing as widely as possible its reports and papers, and the results of experiments conducted under its advice in various parts of the State.”

ANNUAL MEETING.

1876.

TRENTON, February 26, 1876.

The Annual Meeting of the Board was held in Chancery Court Room, opening at 11 o'clock, Hon. Wm. A. Newell, President, in the chair. Twenty-seven members present.

The President opened the meeting with the following

ADDRESS.

GENTLEMEN: We have assembled in annual meeting as members of the State Board of Agriculture, to consider whatever may concern the agricultural interests of New Jersey. The subject is too vast and important to be presented in the few remarks made by the President prefatory to regular business; but it will, no doubt, be comprehensively laid before you in the report of the Secretary of the Board.

THE ANNUAL REPORTS.

Already several Annual Reports have been made, with small cost to the State, which embody much valuable information, and do honor to the distinguished State Chemist and Professor of Agriculture, whose assiduity in the discharge of this laborious and difficult task can hardly be properly understood or appreciated. These reports comprehend a consideration of soils, products, fertilizers, farm

animals and their diseases, farm machines, results of experiments, resources and improvements.

New Jersey continues her claim to be considered

THE MOST FAVORED OF STATES,

in the possession of natural and adventitious advantages, in geographical location, proximity to great cities and the sea, in varied soil and surface, mineral and natural fertilizers.

THE STATUS OF NEW JERSEY.

Among the thirty-seven States, in 1870, New Jersey was :

In size.....	33d
Population.....	17th
Wealth	8th
Products of Manufacturers.....	7th
Capital.....	8th
Products of Mines.....	11th
Agricultural Products.....	20th
Agricultural Implements.....	11th

New Jersey produced 2½ bushels of wheat, 8 bushels of corn, and six bushels of potatoes for every man, woman and child in the State, and was the second in value of market garden products, and the eighteenth in products of the orchard.

THE VALUE OF FARM LANDS PER ACRE,

including all attached to farms, with their rapid increase, can best be seen by a comparison with similar lands in the neighboring States :

	1850.	1860.	1870.
New Jersey.....	\$43 67	\$60 40	\$86 14
New York.....	29 00	38 00	57 36
Pennsylvania.....	27 33	39 00	58 00
Delaware	19 75	31 00	44 40
Connecticut.....	30 50	36 00	53 00
Rhode Island.....	30 82	37 00	42 95
Massachusetts	32 50	34 00	42 64

THE AREA OF NEW JERSEY

is nearly 5,000,000 acres, of which 3,000,000 are in farms, and 2,000,000 are still in forest. These lands are capable of a great improvement, and their product is increasing every year.

FERTILIZERS.

The farm-yard manure, made on all the farms of the State, is worth at least \$3,000,000. \$3,000,000 worth of super-phosphates are made in the State yearly, together with \$150,000 of bone dust. There are 300,000 tons of marl, and 300,000 bushels of lime used within the same period of time.

Thus it will be observed that the

LAND IN NEW JERSEY IS RATED HIGHER,

for agricultural purposes, than the lands in any other State; and this, too, notwithstanding two-fifths of our territory consists of salt meadow and pine barrens, which are comparatively valueless. We rank amongst the leading States in the production of corn, wheat, rye and potatoes to the acre; first in cranberries, and in the quality and value of horses, mules and cows. So our State is in the advance. Intelligent development of our abundant advantages and resources will soon place us beyond the reach of competition as an agricultural State.

Although practicing a profession, an interest in agriculture is no novelty with me. In February, 1851, at the close of my earlier Congressional service, I had the honor to introduce a proposition in the House of Representatives to establish an Agricultural Bureau, and claim to have made the first effort in that direction. I took occasion to remark, in a speech of some length, that agriculture was the occupation of three-fourths of our constituents. We cannot add to its dignity, but we may essentially promote its interests, by creating a

BUREAU AND A SCHOOL OF AGRICULTURE,

and I hazard nothing in saying that such an establishment will effect more good in a single year than can be accomplished by the

dissemination of Patent Office Reports, such as we have had, to the end of time. It will soon be generally conceded that agriculture is now as much a scientific as mechanical pursuit, and that the importance of rightly directing the energies of the people in this engrossing occupation cannot be overrated. * * * * A knowledge of soils, and the proper application of plants to these soils, so that the energies applied in the culture of the earth shall be rationally applied—systematically and rightly applied—will make a difference in the results of farm labor, which will be felt in every grade of life and every department of trade. * * * The advantages to be derived from the establishment of an Agricultural Bureau are immediate and obvious, and not like some schemes which have been pressed upon Congress, remote and speculative. We have a territory embracing such a variety of soil and climate that it may almost be said to be a world of itself. We can cultivate almost every product of the earth which enters into the consumption of the human family.

The aid which agriculture is likely to derive from chemistry, the hand-maid of all the arts and sciences, promises to be as great and wonderful as that which accrues to commerce by the help of steam and electricity.

An agricultural bureau is now a prominent feature of our government, and agricultural schools are provided for by Congressional legislation all over the land.

New Jersey has, by the beneficent action of Congress,

THE RUTGERS SCIENTIFIC SCHOOL,

the State college for the benefit of agriculture and the mechanic arts. Three distinct courses are included in the schedule of the school:—1st—a course in civil engineering and mechanics; 2d—a course in chemistry and agriculture; 3d—special course in chemistry.

As a member of the

BOARD OF VISITORS

I can attest the vigorous and thorough mental discipline to which the students are subjected, their scholarly attainments and also the faithful manner in which the distinguished President and his colleagues discharge their obligations.

Pursuant to the requirements of the Legislature, the Trustees of Rntgers College purchased a farm, without expense to the State, and without any aid from the proceeds of the Congressional land grant. These proceeds have been expended exclusively for the salaries of the Professors in the Scientific School, The Trustees providing farm buildings, stock, labor, machinery, apparatus, and appliances employed in the instruction of the students.

The late Judge McIlvaine and myself were deputized by the Board of Visitors to visit and inspect the

STATE FARM.

We found it in excellent condition, highly improved and cultivated, and capable of producing abundantly.

The experiments, testing the relative value of the various fertilizers now in use, constitute a most valuable part of the operation. Plans are in preparation for an annual series of these trials with ammonia, potash and the phosphates, and we may confidently anticipate the most important results from them to the great agricultural interests, which constitute so essential a feature of our national prosperity.

DESTRUCTIVE AGENCIES.

The commercial fertilizers are liable to fraudulent adulterations ; destructive insects ruin crops ; new diseases destroy our cranberries ; domestic animals are carried off by epidemics ; lands are useless for lack of combined effort to drain them. For all these interests, which are in the hands of 63,000 farmers, some intelligent head is needed to combine their efforts to direct their enterprises, and to protect their rights. All these duties, and many others not enumerated, now devolve upon one man, the Professor of Agriculture, the Secretary of this Board.

AN ASSISTANT NEEDED.

Humanity can not endure the labor involved, and he should be provided with at least one assistant, at the expense of the State. The State Board of Agriculture was established to see that the purposes of the general government and of the State were carried into

execution, and we should ask for means to that end. The expense will be insignificant compared with the good to be accomplished.

A LABORATORY FOR THE ANALYSIS OF FERTILIZERS

is a *necessity, to prevent a wholesale* imposition upon farmers; and experimental stations, at which to try experiments and settle principles in regard to soils, tillage, crops, stock and implements, should be established.

The farm of the State Agricultural College will furnish ground for the principal experiments; and a laboratory located there would be mutually beneficial to the College and to farmers. Agricultural interests underlie and overshadow all others. The edict of the Garden, "by the sweat of thy brow shalt thou eat bread all the days of thy life," will find fulfilment for all time.

Frugal, industrious and independent

LEGISLATION

has rarely been invoked in behalf of farmers, and more rarely conceded. We ask now that a small share of our taxes be diverted from the stupendous appropriations of the day, to enable the Agricultural College and State Farm, institutions established by the munificence of Congress and the Trustees of Rutgers College, and conducted hitherto without expense to the State, to fulfil more thoroughly the object of their establishment. Without such slight assistance they are bereft of power for much additional usefulness. I respectfully recommend to the Board to

APPOINT A COMMITTEE

to confer with the Governor and the Legislature on the subject. It is not needful to argue the necessity or propriety of this measure. It is indispensable, if we expect or desire to see the object for which these institutions are established reasonably fulfilled. Indeed, the necessity is inexorable. We must not turn back.

ADVANCEMENT.

The sickle has been superseded by the harvester in endless variety; the scythe by the mower; the flail by the thresher and cleaner; the

hand-rake by the horse-rake and tedder ; the pitch-fork by the hay-fork ; the tub and shovel handle by the common corn-sheller ; and manual labor is chiefly substituted by horse-power. We must march along in education and experiments with these advancements. The mortal destiny of man is labor, inevitable and unceasing. We venture the hope that our chosen law-givers will not be oblivious to their obligations to alleviate this condition by all suitable legislation.

After the President's address, the Secretary reported on analysis of commercial fertilizers, and experiments on their use, which was followed by general discussion.

The subject of roads and road laws was brought before the Board, and a change in the existing laws was strongly advocated, and a more efficient system for making and repairing roads. A committee was appointed to bring the subject to the attention of the Legislature.

The secretary was requested to collect and report at the next meeting the legal weights of measured quantities of various agricultural and garden products.

REPORT.

To the Legislature of the State of New Jersey, in Senate and General Assembly convened :

The State Board of Agriculture herewith submit their fourth annual report upon the subjects committed to their charge, in the act for organizing the Board, which was passed April 4th, 1873.

The continued business depression throughout the country, which commenced in the fall of 1873, still continues. With our nearness to the great markets of the country, sale can always be found for the great staples, grain and hay, though at diminished prices, but the demand for market garden products has much lessened with the scarcity of money. The prospect for a continuance of good markets in the future is quite as encouraging as ever it was. To those in debt and burdened with the payment of interest, the diminution in values which has attended the hard times is trying, but the number of failures from this cause is much less than it is in any other business of magnitude.

The weather of last winter was favorable to the crops of winter grain, and in most parts of the State the yield per acre has been much above the average. The summer, however, was very dry, the drought being general through July and August, and in some places beginning in June. In those localities where it began earliest, the crops of hay and oats were shortened, and those of corn, potatoes and other root-crops almost or in some cases quite spoiled. Where the rains continued through June, the corn and other summer crops were better, and in some places were very good. The potato crop was very generally ruined by the dry weather. The severity of the drought will be better appreciated by comparing the depth of the rain-fall, by months and by seasons this year, at several places in the State, with that of the average fall in the same length of time and at the same places, for a number of years past.

RAINFALL—1876.

MONTHS.	Newark.	New Bruns- wick.	Trenton.	Vineland.
January	2.61	2.76	0.22	2.35
February	1.20	0.91		2.63
March	5.35	3.37	4.16	3.72
April	10.00	5.10	6.19	6.31
May	3.30	2.27	2.41	2.25
June	3.04	2.49	3.24	6.10
July	1.58	0.82	2.46	5.43
August	3.06	1.59	6.12	3.87
September	2.45	0.76	1.48	2.18
October	7.50	6.04	7.23	9.91
November	1.26	0.70	1.18	1.30
December	4.04	4.26	6.20	5.60
	2.51	2.02	1.40	3.63
Year—1876.....	40.32	30.33	42.27	52.93
Average.....	34 years. 46.06	23 years. 46.09		11 years. 48.51
SEASONS.				
Winter—				
Average	10.53	9.88		11.13
1875-6	9.11	7.04		8.70
Spring—				
Average	11.81	11.43		12.34
1876	16.34	9.86	11.84	11.48
Summer—				
Average	13.66	14.03		12.72
1876	7.09	3.17	10.06	15.40
Autumn—				
Average	11.09	10.79		12.31
1876	12.80	11.00	14.61	16.81

In seasons like those of the past year, when not only crops of a single year's growth, but trees fifty or a hundred years old, are destroyed by the severity of the drought, attention is necessarily drawn to the conditions of soil and sub-soil most favorable to resist the effects of dry weather. For understanding this, in addition to the records of rain and of temperature above mentioned, a knowledge of the geology of the soil, sub-soil and underlying rocks is needed. New Jersey has some well marked and easily recognized geological features, which, though they have heretofore been overlooked, are of prime importance in this respect. The boulder-drift covers the larger part of the northern half of the State, while none is found in the southern half. The southern border of this drift is in a nearly straight line across the State, the north side of the mouth of the Raritan marking its eastern end, and the western is on the Delaware, near Belvidere. It crosses the Pennsylvania Railroad at Metuchen, the New Jersey Central Railroad between Plainfield and Scotch Plains, is a little south of the Morris and Essex Railroad from Summit to Morristown, passes north of Mendham and Chester, crosses the Morris and Essex Railroad a mile north of Hackettstown, the Pequest just below Vienna and Danville, and from there on in a direction a little north of west to the Delaware.

North of this line deposits of earth and boulders, sometimes of great thickness, cover much of the surface and constitute the soil, while south of this line there is no boulder earth, and while there are some deposits of gravel and sand, they are mostly shallow, and the soil is made from the underlying formation, changed only by air, moisture and the varying seasons. Droughts do much less damage to crops upon the boulder-drift soils than to those which are upon the soils south of it. This is a subject upon which much more study and experiment can be profitably applied.

A paper on the influence of the drought of 1870 on the crops in Rothamstead, England, will be found farther on in this report.

COMMERCIAL FERTILIZERS.

This subject is growing in economical importance every year. The use of purchased fertilizers has extended to all parts of the State, and the amount used is increasing largely. The profits of farming are everywhere increased by their judicious use, and there are many

cases in which farms cannot be wholly cultivated without them. It is believed that there is more care exercised in preparing these fertilizers than there was formerly, and the practice of putting certified analyses on the labels attached to the bags or packages, is getting to be followed by dealers and to be required by farmers. This is a favorable indication, and when the practice is fully established and the analysis intelligently used to guide in applying the fertilizer to crops, its full benefits will be obtained.

There has been a marked improvement in the mode of preparing and selling Peruvian guano, which is fairly in operation now. Formerly the guano was sold just as it was gathered and brought in the ships, some portions of a cargo fine, others in hard lumps; some pure, others mixed with sand or earth; and, altogether, not uniform in quality or in good condition for use. Now a cargo is taken, the lumps screened out and crushed, and the whole carefully mixed and made fine. A sample is then analyzed, the certified analysis is printed and put on each bag or package of the whole cargo, and the guano is *guaranteed* to be of that quality, is priced and sold by the analysis. Some cargoes contain more ammonia than others, and some a much larger percentage of phosphoric acid than others. With this variety in composition, agriculturists may select for trial or use on their soils such grades as their study or experience dictates.

Another method of preparing guano to fit it better to the farmers' wants, is, after making it fine, to put sulphuric acid on it, so as to convert the ammonia into sulphate of ammonia, and so make it less liable to loss from evaporation, and to change the insoluble phosphates into super-phosphates, and so fit them better to act immediately on the growing crops. Guano prepared in this way is said to be *rectified*. The analysis also accompanies this kind of guano.

Guano is also sold as in former times, just as it is taken from the vessels, without preparation, and only represented as being free from any additional substance, and from damage by water. It is also accompanied by a certified analysis.

From a pamphlet entitled, "Peruvian Guano: its qualities; brands under which it is sold, and brief directions for using it; issued by authority of M. M. Hobson, Hurtado & Co., agents of the Peruvian Government, No. 63 Pine street, New York; January, 1877." Some of these brands and analyses are here copied:

GUARANTEED GUANO.

Ammonia.....	6.8 per cent.
Phos. acid, soluble.....	3.8 “
“ reverted.....	11.5 “
“ insoluble.....	3.0 “
Potash.....	3.7 “

RECTIFIED GUANO.

Ammonia.....	10 per cent.
Phos. acid, soluble.....	10 “
“ reverted.....	3 “
Potash.....	2 “

NO. 1 PERUVIAN GUANO.

Standard—contains..... 10 per cent of ammonia

NO. 2 PERUVIAN GUANO.

Ammonia.....	3.25 per cent.
Phos. acid.....	15.00 “
Potash.....	2.00 “

These analyses, of course, only show the composition of the cargoes from which they are taken. Other cargoes vary from these in the per centages of ammonia, phosphoric acid and potash.

Prices for these guanos are computed from the analyses, assuming that, for the *guaranteed*,

Ammonia is.....	17½ cents per pound
Soluble phosphoric acid.....	10 “ “
Reverted “ “	8 “ “
Insoluble “ “	2 “ “
Potash.....	7½ “ “

And for the *rectified* guano,

Ammonia is.....	20 cents per pound
Soluble phosphoric acid.....	10 “ “
Reverted “ “	8 “ “
Insoluble “ “	Nothing.
Potash.....	7½ cents per pound

The quantity per ton of each constituent is found by multiplying the per centage by 20, or 22.4, according as the ton is 2,000 or 2,240 pounds.

With this information supplied, farmers can intelligently purchase and apply the fertilizers to their soils.

The following table was prepared and is sent out by Charles V. Mapes, of New York. It furnishes valuable information in a very convenient form, and will be received with satisfaction by all purchasers of fertilizers. The commercial articles quoted, and from which the prices are computed, are for sale by all of the larger dealers in fertilizers, and can be bought by farmers through those from whom they get their supplies of commercial manures.

AMMONIA, PHOSPHORIC ACID AND POTASH. THEIR COST PER POUND AS FURNISHED IN THE FOLLOWING FERTILIZING MATERIALS. BY CHARLES. V. MAPES, 160 FRONT STREET, NEW YORK.

The following table embraces the leading articles adapted to the preparation of Fertilizers; and has been prepared mainly in response to the many queries received from those desiring to make their own fertilizing mixtures or "COMPOUNDS," relating to the strength in Ammonia, Phosphoric Acid and Potash, of the materials, suitable for their use—number of pounds required to yield a given per cent. of either ingredient, comparative cheapness, etc. The question is often asked—What is the *cheapest form* of Potash? By reference to the following table it will be seen that this ingredient furnished in the "MURIATE OF POTASH" (strength 80 per cent.) at *eighty dollars* per ton, costs (8c.) even less per pound than when supplied in the "German Potash Salts," "Kainit," (15 per cent. actual Potash) at *twenty-five dollars* per ton. A higher or lower price of either of these materials will show, by an easy calculation, their comparative economy as sources of supply of Potash. The *Agricultural* value of the following materials will be found not always to correspond with their *commercial cost*, therefore it becomes important to be guided mainly by practical soil-tests and the general experience of others.

AMMONIA—Continued.

	Average ¢ cent. Ammonia.	Price of article.	Assumed ¢ cent. Ammonia.	Commercial value ¢ lb Ammonia.
<i>No. 1 Peruvian Guano.</i> (Government agents' price, \$60 ¢ ton, 2,240 lbs.).....	10 to 12	¢ ton, 2,000 lbs. \$53 57	11.38	\$0 14
On basis of analysis by Prof. W. O. Atwater, Conn. Agricultural Station, 1875.....				
Ammonia.....		lbs. ¢ ton. 11.38x20—227.6 at 14c.....	11.38	14½
Soluble Phosphoric Acid.....		5.80x20—116 at 10.20..		15¾
Insoluble Phosphoric Acid...11.70x20—234 at 4.09..		9.57		17
¢ ton, 2,000 lbs.....		\$53.26		
<i>Rectified Peruvian Guano.</i> (No. 1 Peruvian, treated with Sulphuric Acid).....				
On basis of analysis guaranteed by the Government agents.....		lbs. ¢ ton. 10x20—200 at 17c.....		17
Ammonia.....		\$34.00		
Soluble Phosphoric Acid.....		10x20—200 at 11.73..		
Insoluble Phosphoric Acid.....		1x20— 20 at 04.67..		
Potash.....		2x20— 40 at 04.26..		184
¢ ton, 2,000 lbs.....		\$60.11		

PHOSPHORIC ACID—(Soluble).

PHOSPHORIC ACID—(Soluble).					
	Average % cent. Phos. Acid, sol- uble.	Price of article.	Assumed % cent Phos. Acid, sol- uble.	Commercial value % lb. Phos. Acid, soluble..	
<i>Plain Super-Phosphate.</i>		\$ ton, 2,000 lbs.		\$	
("Acid Phosphates") prepared from South Carolina.....	10 to 16	\$25 00	10	\$0 125	
Or other Rock Phosphates.....		27 50	10	137	
Phosphate of Lime, soluble and reduced, 22 to 35 % ct.....		30 00	10	150	
" " " " " "		30 00	12	125	
" " " " " "		35 00	12	145	
" " " " " "		30 00	15	100	
" " " " " "		35 00	15	116	
<i>Dissolved Bone.</i>					
(Bone Black dissolved in Sulphuric Acid).....	13 to 16	35 00	14	125	
Phosphate of Lime, soluble and reduced, 28 to 35 % ct.....		40 00	14	142	
" " " " " "		40 00	15	133	
" " " " " "		45 00	15	150	
<i>Rectified Peruvian Guano</i>		60 00	10	117	
(See calculation under Ammonia).....		65 00	10	126	

PHOSPHORIC ACID—(Insoluble in Water)—Continued.				
	Average % cent. Phos. Acid, in-soluble.	Price of article.	Assumed % cent. Phos. Acid.	Commercial value % lb., Phos. Acid.
<i>Navassa Phosphate.</i>		\$ ton, 2,000 lbs.		\$ 03
Ground—(Phosphate of Lime, 70 to 74 % cent.).....	32 to 34	\$20 00	33	03
	32 to 34	25 00	33	03 $\frac{3}{4}$
<i>No. 1 Peruvian Guano.</i>				049
(See calculation under Ammonia).....		53 57	11.70	049
" " ".....		55 00	11.70	05 $\frac{1}{4}$
" " ".....		60 00	11.70	05 $\frac{3}{4}$
" " ".....		65 00	11.70	06 $\frac{1}{4}$

POTASH.					Average ¢ cent. Potash.	Price of article.	Assumed ¢ cent. Potash.	Commercial value ¢ lb., Potash.
<i>Muriate of Potash.</i>								
Test 80 ¢ cent., equal to 50.56 Potash.....					50	¢ lb. \$0 02 $\frac{1}{4}$	50	\$0 04 $\frac{1}{2}$
Grades 79 to 89 ¢ cent. Muriate of Potash.....							50	05 $\frac{1}{2}$
							50	06
							50	08
<i>Sulphate of Potash.</i>								
(Concentrated)—grades 55 to 80 ¢ cent. Sulphate of Potash ;							30	099
equal to 30 to 44 ¢ cent. Potash.....					30 to 44		30	133
							40	07 $\frac{1}{2}$
							40	100
							40	125
							44	091
<i>German Potash Salts.</i>								
(Low grade)—“Kainit,” “Dung-salts”—grades 22 to 36 ¢					12 to 20	¢ ton, \$20 00	12	083
cent. Sulphate of Potash ; equal to 12 to 20 ¢ cent. Potash..							12	104
							15	083
							15	100
							16	091
<i>Nitrate of Potash.</i>								
(See calculation under Ammonia)—test 90.80 ¢ cent.....					42 to 44	¢ lb. 07 $\frac{3}{4}$	42.44	082

The desire to economize in the use of fertilizers, and at the same time to get the largest return for their use, is showing itself in all our Middle and Eastern States, in the increased sale of fertilizers for special crops, such as *corn fertilizers*, *potato fertilizers*, fertilizers for wheat, cabbage, turnips, etc. Such fertilizers are compounded by many reputable dealers. They are made from formulas recommended by Professor Stockbridge, of the Massachusetts Agricultural College, by M. Ville, a prominent French agriculturist, and by many others. Their effects must vary with the character of the soil, the climate, and season, where they are used.

Experiments with chemical manures, or with new fertilizers of any kind should first be made upon a small scale, and then as experience with the fertilizers and skill in using them are acquired, they may be used on a larger scale. But experiments are expensive, and whole crops should not be risked in making them. And in the meantime the farmer's reliance must be upon barn-yard manure, muck, lime, plaster, bone dust, super-phosphate, and such other manures as experience has shown to be profitable. The profits of farming will be largely increased by the proper use and application of chemical fertilizers, but in changing from well established practice, new circumstances as well as new materials are introduced, and the changes should be carefully made, or losses may result at first.

ANALYSES OF FERTILIZERS.

PERUVIAN GUANO.

Two samples marked *Guaranteed*, and one sample marked *Rectified*, sent by Chas. V. Mapes, 160 Front street, New York city.

	—Guaranteed—		Rectified
	1	2	3
Phosphoric acid, soluble.....	5.76	4.61	12.67
“ “ insoluble.....	13.70	13.57	
Ammonia	9.37	6.42	10.56
Potash.....		2.90	1.80

These are all good fertilizers, at the prices given on p. 26. (1) is worth \$66 a ton, (2) is worth \$47 a ton and (3) is worth \$70 a ton.

SUPERPHOSPHATES.

Sample marked *Lister's Standard Superphosphate of Lime*, sent by Messrs. Lister Brothers, Newark, N. J.

Phosphoric acid, soluble	9.63
“ “ soluble in cit. amm.....	2.90
“ “ insoluble.....	1.85
Ammonia.....	2.77
Potash	1.74

This standard fertilizer has been analyzed four years in succession, and its composition is uniform. At the prices given on page 26 it is worth \$38 a ton.

Sample labeled *National Soluble Bone*, sent by the U. S. Fertilizing and Chemical Company, Camden, N. J.

Phosphoric acid, soluble in water.....	8.32
“ “ “ in cit. amm.....	3.52
“ “ insoluble	5.12

This superphosphate is made from the Carolina phosphate. It contains no ammonia, and is intended to be ammoniated by the purchasers or farmers who buy it. At the prices before mentioned it is worth \$22 a ton.

Samples labeled (1) *Superphosphate of Lime*, (2) *Moosehead Ammoniated Dissolved Bone*, sent by Lane & Johnston, Newark, N. J.

	(1)	(2)
Phosphoric acid, soluble.....	7.68	5.63
“ “ “ in cit. amm.....	2.37	3.53
“ “ insoluble	3.84	3.90
Ammonia.....	2.58	1.87

These superphosphates are presumed to be made from bones. At the prices before used (1) is worth \$32 a ton, and (2) is worth \$28 a ton.

Sample labeled *Marine Guano*, sent by J. J. Allen's Sons, Philadelphia.

Phosphoric acid, soluble.....	2.66
“ “ sol. in cit. amm.....	3.69
“ “ insoluble	1.62
Ammonia.....	3.58
Potash.....	1.61

This fertilizer, by the prices used, is worth \$28 a ton.

Sample labeled *Ground Bone*, sent by Smalley & Elmer, Bridgeton, N. J.

Phosphoric acid.....	20.30
Ammonia	4.07

This is pure ground bone. At the prices used it is worth \$35 a ton.

Samples labeled *Popplein's Silicated Super-phosphate of Lime*, (1) sent from C. T. Raynolds & Co., of New York city; (2) sent from G. W. Johnson, Philadelphia.

	(1)	(2)
Phosphoric acid, soluble in water.....	2.18	5.31
“ “ “ “ cit. amm.....	1.15	1.73
“ “ insoluble	3.33	4.42
Potash.....	4.34	9.30
Soluble silica.....	8.50	4.50

This fertilizer is superphosphate of lime, with the addition of potash salts and infusorial earth. A part of its fertilizing value is attributed to the infusorial earth, which, in the analysis, is called soluble silica. The value of soluble silica as a fertilizer has not yet been proved, and no attempt is made here to compute its worth in these samples. The other constituents, at the prices used, are worth (in 1) \$13 a ton, and (in 2) they are worth \$27 a ton.

Sample of *Leached Wood Ashes*, from Canada, as sold in New York.

Carbonate of lime.....	70.5
Soluble silica.....	5.1
Phosphoric acid.....	1.6
Potash.....	a trace
Magnesia.....	2.5
Oxide of iron and alumina.....	6.5
Sand.....	2.3
Water, by loss.....	11.5
	<hr/>
	100.0

This is an ordinary sample of leached ashes, and it is always satisfactory as a low-priced fertilizer. Its common price, at present, is about \$5 a ton. The phosphoric acid is worth, at the price of that soluble in citrate of ammonia, \$2.50. Whether the soluble silica adds anything to their value is uncertain.

Sample marked *Lacustrine*, sent from 64 Courtlandt street, New York.

This is common shell marl, from fresh water ponds. It is composed almost entirely of fine carbonate of lime, and when used in large quantities is a good fertilizer. It is not worth near as much as the leached ashes just described, and the price asked, \$10 a ton, is entirely too large.

AGRICULTURAL COLLEGE FARM.

EXPERIMENTS UPON THE GROWTH OF INDIAN CORN WITH VARIOUS FERTILIZERS, IN THE SEASON OF 1876.

The experiments were made on a red shale soil, rather hard and stubborn. It had been a meadow in good condition for four years, but the grass had run out, and it was ploughed up to be tilled and reseeded. It was judged to be of uniform quality, though from the experiments it may be inferred that some portions were more sensitive to drouth than others. The corn was planted in hills $3\frac{1}{2}$ feet apart each way, and with three or four grains in a hill. After

planting, the fertilizers were applied on the hills, but scattered about somewhat. The plots were of one-tenth an acre each. The fertilizers used upon the several plots, and their rates per acre, are given in the following table, as follows :

FERTILIZERS.	NUMBERS OF THE PLOTS.								
	1	2	3	4	5	6	7	8	9
Plain superphosphate of lime, in lbs.....	.....	500	.....	.....	300	500	.....	.....	.....
Sulphate of amonia, in lbs.....	300	.....	.....	.....	200	100	.....	.....	.....
Muriate of potash, in lbs.....	.....	.....	150	.....	150	150	.....	.....	.....
Mixed potash salts, in lbs.....	.....	.....	.....	.....	.....	.....	150	.....	.....
Forrester's corn fertilizer, in lbs.....	.....	.....	.....	.....	.....	.....	.....	758	.....
Cost per acre, in dollars.....	\$14 64	\$10 00	\$3 57	\$0 00	\$19 34	\$18 45	\$4 50	\$18 00	\$0 00
Ears of corn per acre, in lbs.....	1700	1950	1950	2050	2200	2800	2400	2400	2200
Corn in bushels of 80 lbs each.....	21	24	24	26	27	35	30	30	27
Stalks in lbs, per acre.....	3250	3050	2950	2950	3150	3600	3350	3070	3000

There are no satisfactory inferences to be drawn from these results, and were it not for the regular continuance of the series of experiments on Indian corn, which have been continued for five years in succession, these might have passed without publication.

The experiments have had for one object, the proving the effect of muriate of potash on the growth of corn and stalks (a).

In the absence of any results here, it is satisfactory to present the result of an experiment of the same kind, which is conclusive, and was made in Morris county, just opposite Beattyestown, in Warren

(a) The experiments with this fertilizer for the several years are here repeated—the results being in bushels of corn and pounds of stalks per acre.

Year.	Lbs. per acre.	MUR. POTASH.		—NO MANURE.—	
		Bush. corn.	Lbs. of stalks.	Bush corn.	Lbs. of stalks.
1872.	250	69	7104	69	6000
1873.	250	59	4646	64	3945
1874.	100	57	3787	48	3312
1875.	100	100	6150	85	5500
1876.	150	24	2950	26	2950

These experiments show that muriate of potash increases the weight of the corn stalks. The soils on the trial plots of 1872-3 & 6, were quite as good as that of the plots of 1875, and the differences in the crops are, judging from the tables of rain fall, owing to the greater or less amount of rain in June, July and August.

RAIN FALL, BY MONTHS.

	June.	July.	August
1872.	3.85	8.97	7.12
1873.	3.88	9.47	10.79
1874.	3.05	4.02	2.85
1875.	4.56	3.94	8.08
1876.	0.82	1.59	0.76
Average 23 years.	4.03	4.84	5.16

county, by the Hon. Aaron Robertson. His letter giving a full and clear statement of his experiment and the result is here presented.

BEATTYESTOWN, October 21st, 1876.

DOCT. GEO. H. COOK—*Dear Sir* :—About the 11th of May last, I applied five hundred pounds of muriate of potash, purchased of H. J. Baker & Brother, No. 215 Pearl street, New York, on five acres of corn planted the 5th of May, on the hill, before the corn came up. A moderate rain fell three or four days afterwards, which washed the muriate into the ground so that but little appeared on the surface. On the 21st of May, perhaps the heaviest rain of the last forty years fell in the afternoon, which left the whole surface of the ground, corn included, nearly covered with water the next morning. This was followed by another heavy rain on the afternoon of the 22d. It was expected that the corn would require entire replanting, but after two or three days it was found that what remained was alive, and it was only replanted where it was washed out.

The season afterwards was dry, reaching at length to an extreme drought.

About three acres of the land was originally the outlet of a swamp containing springs of water, was nearly level, with a hard-pan bottom of nearly white clay and thin soil, but had been drained by deep open ditches, which has diverted the spring water entirely. Corn had only been planted on it once in forty years, (in 1873.)

The remaining two acres was land of good quality, being a drift soil on the top of the limestone on the bank of the Musconetcong creek.

Adjoining the two acres was a strip of the same kind of land upon which no muriate or other manure was applied, and the muriate was applied on all the hard-pan land planted.

Equal quantities, about one-third of an acre each, of the corn on the drift soil, where the muriate was and where it was not applied, was cut and husked separately, and the increase of the quantity, where the muriate was applied, was about one-fourth. The stalks were not weighed, but apparent increase on the manured land was fully equal to that of the corn.

On the hard-pan land there was no opportunity for comparison, excepting with the crop of 1873, which was a good season, but it was apparent that the benefit was much greater than on the drift;

notwithstanding the drought, the crop was much larger than that of 1873. The superior thrift of the manured corn was plainly seen the whole season; while the other corn rolled every day during the dry weather, this remained fresh with expanded leaf.

The experiment was made under the most adverse conditions on account of the flood, which, although it was not deemed advisable to replant over the whole ground, reduced the number of stalks fully one-fourth, and on account of the want of rain afterwards which shortened the crop seriously, so that a statement of the yield per acre would do injustice both to the muriate and to the land, I feel certain, however, that the value of the manure was much beyond the expense.

Truly yours,

AARON ROBERTSON.

EXPERIMENTS UPON THE GROWTH OF WHEAT WITH DIFFERENT
FERTILIZERS, IN THE SEASON OF 1875-6.

These experiments were made upon a large field of twelve acres, and the results were obtained by taking the crops from a square rod of that which had been enriched by each fertilizer, taking them all from a strip across the field which was judged to be of uniform quality. The field was formerly the poorest on the farm, and although it has been underdrained and manured it is still somewhat lacking in mellowness of soil, and the sub-soil is not uniform in texture, being very hard and close in some places, and more open in others. And this variation is so irregular and so frequent, that it is difficult to avoid its ill effects. The wheat grown was the Fultz variety. The following fertilizers were tried, and with the results here stated per acre :

FERTILIZERS.	NUMBER OF PLOTS.							
	1	2	3	4	5	6	7	8
Size of plots in acres.....	1.66	1.	1.	1.	1.	.5	.5	5.33
Lister's super-phosphate of lime, pounds....	300	.....	.....	.....	.....	.....	.....	.....
Plain super-phosphate of lime, pounds.....	.....	200	200	400	200	.....	.....	200
Sulphate of ammonia, pounds.....	.....	100	200	100	100	.....	.....	.....
Muriate of potash, pounds.....	.....	.....	.....	.....	100	100	.....	.....
Gypsum, pounds.....	.....	.....	.....	.....	.....	200	.....	.....
Dried blood, pounds.....	.....	.....	.....	.....	.....	.....	.....	100
Cost per acre, in dollars.....	\$5 00	\$8 00	\$12 75	\$11 00	\$10 00	\$3 25	.....	\$5 00
Wheat per acre, bushels.....	48	40	34	40	40	40	37	40
Straw, pounds.....	4320	4480	4640	4000	4160	3040	4160	5120

The crop of wheat upon this field was very fine, as can be seen from these trial plots. The average for the whole field was thirty-three bushels per acre. It is our first attempt at experiments with fertilizers upon wheat. The method of growing, harvesting and threshing wheat, renders it more expensive to get accurate results, than with corn or potatoes. In this case, the plots measured and weighed were too small, and so not as reliable as larger ones would have been; an error in any of them being necessarily magnified one hundred and sixty times.

The accompanying remarks, &c., from the eminent agriculturist, Mr. Lawes, of Rothamsted, England, have been received and read with much interest. And they are here presented as showing the subjects and the character of the inquiries which occupy the attention of one of the most thorough and persevering investigators in the field of agricultural science.

The experiments which are the subject of his remarks were not made to demonstrate principles, but to furnish a guide for farm practice. The demonstration of principles, such as Mr. Lawes wishes to see proved, requires an expenditure of time, labor, and money quite beyond anything at our command now.

REMARKS UPON THE NEW JERSEY STATE BOARD OF AGRICULTURE
FOR 1875. BY J. B. LAWES.

The interest I take in all questions relating to agriculture in the United States must be my apology for the following remarks:

ARTIFICIAL MANURE.

Farmers are quite right in purchasing the ingredients they require and mixing them. Analysis is their only protection. Nitrogen, phosphoric acid and potash are the only ingredients worth purchasing. It is very desirable that the analyses shall state the form in which the nitrogen exists as nitric acid and ammonia are of higher order than organic nitrogen. The determination of phosphoric acid soluble in water and citrate of ammonia is useful.

EXPERIMENTS ON INDIAN CORN.

It is to be regretted that these experiments were not tried upon

a more exhausted soil. Land that grows 80 bushels does not require manure. This is quite evident from the fact that good yard manure did not produce as much as one-half a bushel of corn for each ton used. What is required both for service and practice is how to produce a full crop from a soil which is only capable of growing half a crop. If the manures used in the experiments had been tried upon a field capable of yielding 20 or 30 bushels without manure, it is probable that experiments 10 and 12 would give a larger produce than any of the other manures. Four hundred pounds of sulphate of ammonia will contain about 80 pounds of nitrogen. If we assume that the dry produce of corn and straw together contain three-fourths per cent. of nitrogen, 400 pounds of sulphate of ammonia would furnish as much nitrogen as 60 bushels of corn or its equivalent of straw would contain. In our experiments not much more than one-half of the nitrogen is recovered in the first crop in the wheat, barley and oats. It is of very great importance to know to what extent the Indian corn follows the same law, that is to say on a soil which will, under a liberal supply of potash and phosphoric acid, yield 20, 30 or 40 bushels of corn, what increase is obtained by a liberal supply of ammonia and nitrates. No experiments tried in the States upon Indian corn either prove or disprove what appears to be a general law, that starch or sugar produced in the graminaceous plant is obtained from the atmosphere and not from the soil, and that the quantity obtained on a given area is dependent upon the amount of nitrogen which the plant is capable of obtaining from the soil, the necessary mineral being also present. I have quite recently shown that a similar law holds good in regard to the production of sugar in the sugar beet.

SOIL ANALYSES.

These analyses show most clearly how very deficient in lime are the soils of New Jersey and the beneficial effects of lime and gypsum are fully accounted for. The absence of any notice of nitrogen in these analyses proves to me that the great importance of this substance is not yet fully recognized. I give below the per cent. of nitrogen in a few selected soils and the calculated quantities in pounds per acre in the first nine inches from the surface:

	Nitrogen, per cent.	Pounds per acre.
1	.505	10,100
2	.401	8,020
3	.261	5,220
4	.400	8,000
5	.310	6,200
6	.112	2,240
7	.100	2,000

1. The celebrated Russian black soil in the province of Sumara is supposed to be one of most fertile soils in the world.

2. Sample from another part of the above.

3. Boussingault's Garden, in Alsace, had been heavily manured for centuries.

4. Garden soil at Rothamsted. This has grown red clover for 20 years in succession without manure.

5. One of the most fertile meadows in Ireland.

6. Rothamsted rotation experiment. Turnips, barley, beans and wheat have been removed for 25 years and no manure applied.

7. Rothamsted permanent wheat field. Thirty-five crops removed without manure.

THE INFLUENCE OF THE DROUGHT OF 1870 ON THE CROPS IN ROTHAMSTED, ENGLAND. BY J. B. LAWES AND J. H. GILBERT (*a*).

Observations on the effect of a single dry year upon crops would, of themselves, attract less general interest had we not extensive observations, by the same investigators, extending through many years, upon the crops obtained in normal years, which, by their sharp contrast with the results obtained in 1870, serve to confirm the latter.

Further, the drought of the year in question was such as had not been experienced in England since 1844; from almost the beginning of vegetation until the harvest, no rain fell. The drought was universal.

The studies on the action of the abnormal weather were made on oats, wheat and grass. The observations on the latter being of most interest are the only ones given here.

(*a*) Journal of the Royal Agricultural Society of England, Ser. II, vol. 7, part 1. The above is abridged from an abstract in Biedermann's Central-Blatt für Agr. Chemie, 10, 340.

The land was divided into three plots, of which No. I had remained unmanured for fourteen years; No. II had received yearly per hektare (a) 448 kilogrammes (b) of ammonia salts (c), with mineral manure (without nitrogen), and No. III, 600 kilogrammes Chili saltpetre, with mineral manure.

The following table contains

THE AMOUNT OF THE CROPS, AND OF THE RAIN FALL, FOR A SERIES OF YEARS :

YEAR.	KILO'S HAY PER HEKTARE.				RAIN FALL IN CENTIMETRES(d).			
	I.	II.	III.	Average.	April.	May.	June.	TOTAL.
1856...	2812	7039	.....	4953	6.25	11.75	4.75	22.75
1857...	3125	7125	.....	5125	5.50	2.75	5.50	12.75
1858...	2750	8000	6250	5400	6.25	6.25	2.40	14.90
1859...	2750	6875	6750	3275	6.75	5.00	6.75	18.50
1860...	3000	6250	6125	5125	4.70	10.75	15.50	30.95
1861...	3125	7000	6500	5542	4.50	2.50	7.25	14.25
1862...	3375	7025	6375	5592	7.00	7.25	8.50	22.75
1863...	2500	6625	7250	5458	2.40	2.50	11.50	16.30
1864...	3000	6250	7500	5583	3.75	4.50	4.70	12.95
1865...	1375	4250	5875	3806	1.17	7.50	1.70	10.27
1866...	2875	5500	7250	5208	4.75	3.50	11.25	19.50
1867...	3375	6000	8000	5791	7.00	4.25	2.50	13.75
1868...	2125	7375	8625	6041	5.45	1.82	0.92	8.19
1869...	4750	8500	9500	7543	5.25	8.00	2.50	15.75
1870...	725	3625	7000	3750	1.15	3.25	2.25	7.65
Average	2771	6527	7350	5206	4.75	5.75	5.75	16.25

On the unmanured plot can be seen immediately how the variations in the yield correspond with the *distribution of the rain in the different months*, while they seem to be not at all influenced by the total rain-fall. The maximum was produced when five-sixths of the rain fell in the first two months. The droughts of 1865, 1868, and

(a) A hektare is about two and one-half acres.

(b) A kilogramme is about two pounds.

(c) Equal parts sulphate and chloride.

(d) A centimetre is equivalent to about four-tenths of an inch.

especially of 1870, show very marked results, the crop of the latter year being only one-quarter of the average for the preceding years.

The ammoniacal manuring (II) produced in the first years much more hay than that with saltpetre on plot III; from 1863 on, the relations of the two were reversed, and the difference is greatest in the dry year 1870. Here the crop obtained with ammonia salts is 3,375 kilos less than that reached with saltpetre, and falls considerably behind the yields of preceding years.

The authors calculate, from the results of earlier researches, that the 7,000 kilos of hay from plot III needed for their development 1,700 cubic metres of water, while the soil received in form of rain only 760 cubic metres.

Neither would the amount of rain be sufficient for the crop from the ammonia plot, but for the 725 kilos from the unmanured field there was a considerable excess.

Such considerations led to determinations of the water contained in the soil of the different plots.

The samples were taken July 20th, at various depths, and showed that the *upper layer* (22.5 c. m.) of the *manured plots was much moister than that of the unmanured*; that, on the contrary, in the deeper layers, to a depth of 1.33 metres, and doubtless much further, the unmanured soil was richest in water.

As a whole, it was found that the unmanured plot contained more moisture than that manured with ammonia salts, and that this again fell behind that manured with saltpetre.

The botanical analysis of the hay gave the key to the explanation of these new and interesting observations.

On the unmanured field fifty-three species were found, among them seventeen *gramineal* and five *leguminoseal*. Their roots were extraordinarily weakly developed, and were distributed only sparingly and in the upper layer; they had been able to cause a noticable alteration of the soil and sub-soil only to a depth of 45 centimetres, they mostly reached no further, and therefore took their supply of water from this layer only.

On plot II, which had received its nitrogen as ammonia, only thirty species were found, the most abundant being shallow rooted plants.

Among the thirty species found on the plot manured with saltpetre, *deep-rooted* plants were most abundant, especially *Bromus*

mollis (soft chess.) and *Poa trivialis*, the former constituting nearly half the hay.

The unmanured soils were very much altered by the roots.

The ammonia plot showed a complete mat of roots to a depth of 15 centimetres. Beyond the depth of a metre the sub-soil was not altered.

On the plot which received the saltpetre, on the contrary, the length of the main root was particularly noticable, while only the side roots branched into the upper layer.

Bromus mollis especially had shown its tendency to deep rooting, and had altered the sub-soil completely to a depth of 1.2 metres. The lower layers were softer and milder in comparison with the other plots, and had a darker color.

From these observations we may conclude that a continued manuring with ammonia salts on the one hand and with nitrates on the other, produces, other things being equal, a considerable alteration in the predominant varieties; that when the supply of nitrogen is in the form of ammonia the shallow-rooted plants gain the upper hand in the struggle for existence, while nitrates favor the deep rooted.

In consequence unmanured plants and those manured with ammonia take their water supply only from the upper layers of the soil, and are therefore less favorably situated in dry weather than those that on account of manuring with nitrates have found long roots and made the sub-soil a better conductor for moisture; the latter draw from a much larger reservoir.

The difference in the rooting seems to find its explanation in the different absorptive power of the soil for nitrogen compounds.

The ammonia salts are absorbed by the upper layers and rendered comparatively insoluble, while the nitrates are simply held dissolved in the capillary water of the soil and go with the latter into the sub-soil.

The roots develop themselves most vigorously only where they find abundant nitrogenous food, and thence comes the effect of continued manuring with ammonia or nitrates on the process of natural selection and on the alteration of the sub-soil.

It may be mentioned that a plot lying by the side of the experimental field, received in the same years a rich manuring with stable manure, without increasing its yield; the crop was the same as that of the unmanured plot.

In regard, then, to the influence of manuring in dry years, those plants that receive an easily soluble manure have the advantage, since they are less dependent on the plant food brought down by the rain, or made soluble by it in the soil ; stable manure seems to need large quantities of water before it becomes so far decomposed that its constituents are available to the plant. In addition to this we have the effect on the development of the roots already noticed.

The observations on wheat, and also on barley, confirmed in general the above results, although the differences were smaller and the results less striking.

Translated and prepared by

H. P. ARMSBY, Ph. D.

Rutgers College, New Brunswick.

MARLS.

DIVISIONS.

I. GREENSAND MARLS.

II. TERTIARY MARLS.

III. CALCAREOUS MARLS.

DIVISION I.

GREENSAND MARLS.

GEOGRAPHICAL EXTENT.

The part of New Jersey, in which these marls are found, is included in a belt or strip of country, which stretches obliquely across the State from Raritan bay and the Atlantic ocean on the north-east to the head of Delaware bay on the southwest.

Its northwest border can be traced from the shore of Raritan bay a little south of Chesquake's creek in a southwesterly direction, in a line passing north of the village of Morristown, and on just south of Jacksonville; then across the country by the house of the late Parker Brown to the little village called Texas, on the Matchaponix creek; and from thence directly on, passing about a mile south of Jamesburg Station, and crossing the Camden and Amboy Railroad near Cranberry Station, it passes about a half mile north of Hightstown, and thence in a line a half mile north of the Railroad to the mouth of Crosswicks creek, on the Delaware, near Bordentown. It follows the bank of the river to Kinkora, from which place it is

extremely difficult to trace it with accuracy, the marl beds being entirely hidden by superficial deposits and soil, except in the banks of the streams. Guided by these marks the line has been drawn. It follows near the line of the railroad east of Florence; a half mile east of Burlington, crosses the Rancocas a mile above Bridgeborough and the Pensauken, some distance above Cinnaminson bridge; it comes to the bank of the Delaware again at Gloucester city; it passes back of Red Bank, crosses Woodbury creek a mile above its mouth, Mantua creek near Paulsboro, and Raccoon creek a mile above Bridgeport; thence it continues in the same direction to the Delaware near Penns Grove.

From Penns Grove to Salem the line follows the Delaware river, which in this distance runs across the belt. Heavy beds of alluvium cover the borders of the marl at places along the river.

The southeastern boundary of the formation is much more difficult to define. There is no rock, the surface is uniform, and the soil and sub-soil are everywhere more or less sandy. While the line drawn cannot be far from the true location, its exact place has frequently been a matter of doubt.

The line runs a mile south of Salem City and within half a mile south of Woodstown, near Eldridge's Hill and Harrisonville, two miles and a half southeast of Mullica Hill, two miles southeast of Barnsborough, half a mile southeast of Hurffville, half a mile southeast of Blackwoodtown, through Clementon, near Gibbsborough, Milford, Chairville, Buddstown, two miles southeast of Pemberton, two miles southeast of New Egypt, thence to the Manasquan a mile above Lower Squankum, to Shark river just above the village, and to Corlies' Pond and the seashore at Deal.

The extreme length of the formation from the Highlands of Navesink to the Delaware, at Salem, is one hundred miles. Its breadth at the northeast end, from near the mouth of the Cheesquake creek to Deal, is nineteen miles, and at the southwest end, from the mouth of Oldman's creek to Woodstown, it is nine miles. The area included in this formation is not far from one thousand two hundred and fifty square miles.

The general surface of the country is smooth and uniform, being south of the deposits of boulder earth, and its slight inequalities of elevation have been produced by denudation. Along the middle of the State the country rises to a height of near two hundred feet, and

maintains this elevation from the north line of Monmouth quite down to Cumberland county. On the east, the surface descends gradually to the seashore, and on the west it falls off with like uniformity to the Delaware. A chain of hills, extending from the Highlands of Navesink westward across Monmouth county, rises somewhat above the general level of southern New Jersey.

GEOLOGICAL STRUCTURE.

The greensand formation consists of a series of beds or *strata*, lying conformably upon each other, and all having a gentle descent or *dip* towards the southeast. The strata differ from each other in mineral composition, but they are all earthy in form, except at a few detached points, where the material of the strata has been cemented, by oxide of iron, into a kind of sandstone or conglomerate. They appear to have lain without disturbance in relation to each other ever since their deposition from the ocean; having no folds or curves in them, but lying smooth and parallel, like the leaves of a book. As the dip of the strata is towards the south-east, their edges show themselves upon the surface in north-east and south-west lines. If the county were level, these lines would be straight; but, owing to inequalities in the *surface*, they present irregularities of greater or less extent, curving to the north-west on high ground, and to the south-east on low or descending ground. The lowest strata have their *outcrop* farthest to the north-west.

These explanations will be better understood after an examination of the following tabular arrangement of the strata, and also of the sections:

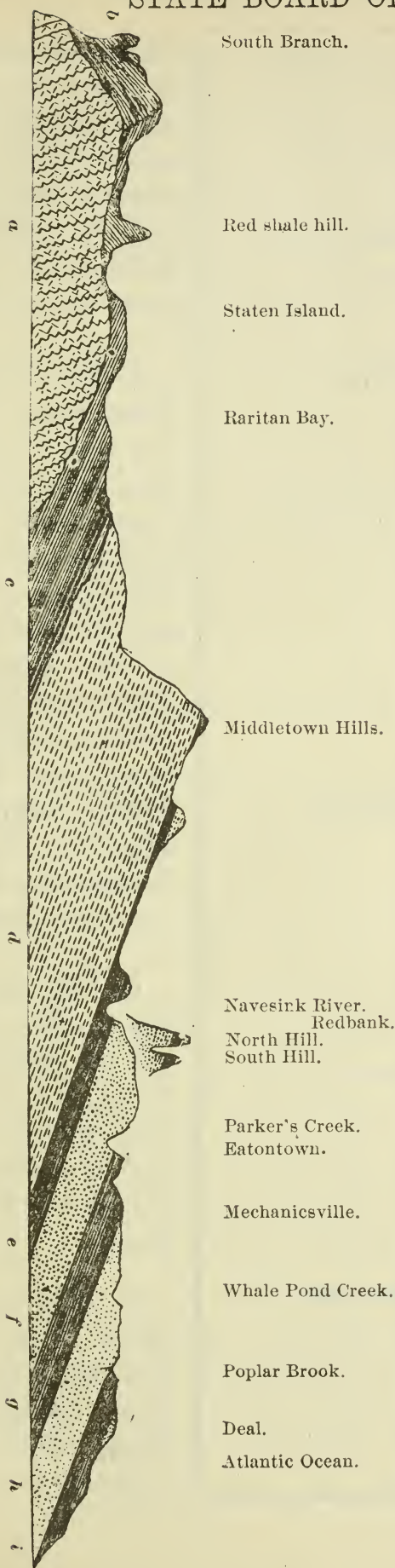
TABLE OF THE DIVISIONS OF THE GREENSAND FORMATION, IN THE ORDER OF THEIR OCCURRENCE.

DIVISIONS.	SUBDIVISIONS.
<i>Upper Marl Bed</i>	{ Blue Marl. Ash Marl. Green Marl.
<i>Yellow Sand</i>	Yellow Sand.
<i>Middle Marl Bed</i>	{ Yellow Limestone and Lime Sand. Shell Layers. Green Marl. Chocolate Marl.
<i>Red Sand</i>	{ Indurated Green Earth. Red Sand. Dark Micaceous Clay.
<i>Lower Marl Bed</i>	{ Marl and Clay. Blue Shell Marl. Sand Marl.
<i>Clay Marls</i>	{ Laminated Sands. Clay containing Greensand.

The section from Rahway, in Middlesex county, to Deal, in Monmouth county, Fig. 1, which is here inserted, shows all the beds in the order of their occurrence, as seen when looking northeast. *a* is gneiss; *b* is red sandstone; *c* is plastic clay; *d* is the clay marl and the laminated sand; *e* is the lower marl bed; *f* is the red sand; *g* is the middle marl bed; *h* is the yellow sand; and *i* is the upper marl bed.

Figure 2 on page 50, is a columnar section, showing all the beds of the greensand formation as they would appear if piled one on top of another, throughout, and in the order of their succession. It also shows their comparative thickness, its scale being one hundred feet to one inch, vertical.

Section from Rahway to Deal.
FIG. 1.

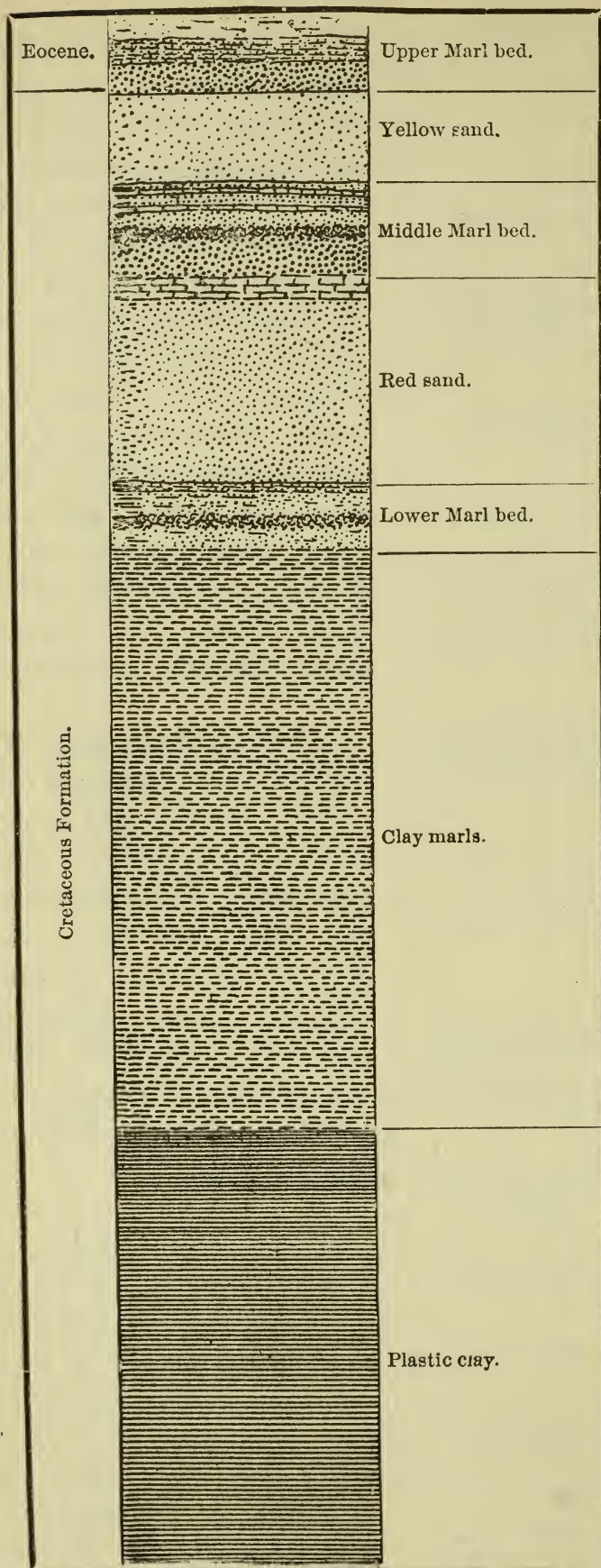


1. CLAY MARLS.—These marls lie immediately south-east of the plastic clays, and are separated from them by a line which is easily recognized. It can be traced upon the map almost straight from just north of Chesquake creek on Raritan bay, to Bordentown on the Delaware. From thence down to the Delaware near Salem, its north-west border is parallel to the river. The material of which the clay marls is composed is chiefly a dark-colored clay, with greensand grains sparingly intermixed.

2. LOWER MARL BED.—This is a stratum of greensand marl, which is largely used in agriculture. It lies along the south-east border of the clay marls, and can be well seen in Middletown, Marlboro, Holmdel, Freehold, Cream Ridge, Arney's Town, near Mount Holly, near Haddonfield, Carpenter's Landing, Batten's Mill, and Marshallville.

3. THE RED SAND.—The material lying over, and to the south-east of the first marl bed, is composed mainly of a reddish sand, having more or less clay intermixed at both its upper and lower parts. Its characteristic appearance is well seen at the Navesink Highlands, at the Red Bank

FIG. 2.



Hills in Monmouth county, just west of Freehold, in the Red hill south of Shelltown, in the mount at Mount Holly, at Mullica Hill, and in many other places.

4. THE MIDDLE MARL BED.—With this bed of green-sand belong yellow limestone and lime-sand, the marls near Eatontown, those near BlueBall, north of New Egypt, at Pemberton, at Vincentown, Medford, Marlton, White Horse, Barnsboro, Mullica Hill, Woodstown, Salem and other places.

5. THE YELLOW SAND.—This material lies immediately on the middle marl bed and is not well characterized, though everywhere found.

6. THE UPPER MARL BED.—This bed consists of green sand disposed in layers, which are parallel to those

already mentioned, and it lies immediately to the southeast and upon them. It is well seen in the marls of Poplar, Shark river, Squankum, New Egypt, northeast of Pemberton, and at Clementon; southwest of which this bed has not been identified. The cross-section (Fig. 1,) shows their relative positions, and the columnar section (Fig. 2,) gives the thickness of the members and their subdivisions.

The direction or *strike* of the strata has been obtained by taking two points in the Lower Marl Bed, which are at tide level and on opposite sides of the State, and then drawing a straight line between them. It touches the Lower Marl Bed at tide water on Sandy Hook bay, opposite Red Bank, near the mouth of Hop Brook, at Mt. Holly, Clement's bridge, Carpenter's Landing and above Sculltown, at Marshallville, Salem county, and St. Georges, Delaware. The distance from St. Georges to Sandy Hook bay, is one hundred and six miles, and finding the marl at intermediate points on the same level, and in the same line, proves that there is no important change of direction in the strike for the whole distance. The true bearing of this line is S. 55° W. It is evident, from an inspection of the map, that the belt of country in which this formation lies narrows towards the southwest.

The inclination, descent, or as it is technically called *dip*, is at right angles to the *strike*; of course if taken from the strike of the Lower Marl, its bearing will be S. 35° E. The amount of the dip is only about thirty feet in a mile. The pits of John M. Perrine, north of Freehold, are one hundred feet above tide and three miles northwest of the tide level line above described; this gives thirty-three feet per mile descent. This marl bed is considerably too high at Cream Ridge and at Arneystown for the usual dip, and there is either an elevation of the marl here or a curve to the southeast. From this point on towards the southwest, the bed is too little exposed to furnish accurate data from which to calculate its dip, but enough has been ascertained to show that it continues nearly the same.

In the middle marl bed, the bottom of the marl at Mullica Hill is seventy-one feet above tide; at Stratton's marl pits, nearly two miles up the north branch of Raccoon creek, the bottom of the marl is twenty-nine feet above tide, giving a descent of twenty-one feet per mile; the hill at Red Bank, Monmouth County, is one hundred and twenty-two feet; at Parker's creek, two miles southeast, the bottom of marl is at tide-level; the descent here is sixty-one feet per mile.

The old road from Keyport to Holmdel, at its summit on Big Hill, just touched the bottom of the second marl bed, at the height of three hundred and two feet; eight and a quarter miles southeast of this the marl is at tide-level. This gives a descent of nearly thirty-seven feet per mile. Marl on the east side of the road from Freehold to Blue Ball, is at top one hundred and twenty-three feet above tide. Shepherd's marl south of Blue Ball, is eighty-four feet above tide; the distance between them, measured in a southeast direction, is about one and one-eighth miles, giving a descent of a little over thirty-four feet per mile. At Mount Holly, the marl in the Mount is one hundred and fifteen feet high; at the Pemberton Marl Co.'s pits it is only twenty-six feet above tide. The two places, measured on the line of dip, are three and a half miles apart, which gives a descent of twenty-five and three-sevenths feet per mile.

At Winslow, which is twelve and a quarter miles southeast of Clementon, and at about the same elevation, the marl was struck at the depth of three hundred feet. If this is the upper marl bed it gives it a decent of twenty-five feet per mile. Other levels of the upper marl bed have been taken at New Egypt, Squankum, Shark River, and Deal, but the distances in which the marl is exposed, are so short that the results can be given only approximately. It is judged, however, that the descent is about twenty-five feet per mile.

Thickness of the Formation.—There have been no borings down through the whole of these strata so as to measure their thickness, and we are obliged to measure the different parts as they are exposed in gulleys, hillsides or artificial openings in different places, and add them together. The results are given in the following table, and details are given in the description of the various strata :

Clay marls.....	277 feet
Lower marl bed.....	30 "
Red sand.....	100 "
Middle marl bed.....	45 "
Yellow sand.....	43 "
Upper marl bed.....	37 "
<hr/>	
Total thickness.....	532 "

GEOLOGICAL AGE.

This formation is all included in the Cretaceous Period (*a*), excepting the upper layer of the Upper Marl Bed, which belongs to the Eocene portion of the Tertiary. Of the three modes of determining Geological Age, viz.: by superposition, mineral composition, and organic remains, the latter is principally relied on in the present case.

The name, Cretaceous, was given to this formation in England, on account of the white chalk which is there a conspicuous member of it. The name is retained among geologists even when the chalk is wanting, as is the case in this country. The mineral substance greensand, is found in rocks of many different ages, but nowhere else so abundantly as in the Cretaceous rocks of Europe, and of the United States. This common characteristic is not without weight in determining the age of the formation.

The organic remains of the formation are very abundant and furnish satisfactory evidence upon the question of Geological Age. The bones of enormous crocodiles and other saurians are found in immense numbers in the clay-marls, and in the beds of greensand; they are usually found scattered, a single one in a place, but sometimes almost a whole skeleton is found together. They have been collected in many places. The Academy of Natural Sciences, at Philadelphia, has probably the best collection of them. There are a good many in the museum of the Geological Survey, at Trenton, and in the cabinet of Rutgers College, and public and private collections in all parts of the country contain specimens. These saurians have not been found in any age in such numbers since the Cretaceous.

Fossil shells are more abundant and better preserved than any other animal remains. Being so much less perishable than others, the entire series of them, in all geological periods, is more complete;

(*a*) The Cretaceous beds of Europe have been divided into—

"1. The *Lower Cretaceous*, including in England the *Lower Greensand*, 800 to 900 feet thick, and in other regions beds of clay and limestone, sometimes chalky.

"2. The *Middle Cretaceous*, including in England the clayey beds or marls called *Gault*, 150 feet thick, and the *Upper Greensand*, 100 feet.

"3. The *Upper Cretaceous*, including in England the beds of chalk, in all about 1,200 feet; it consists of the *Lower* or *Gray Chalk*, or *Chalk Marl*, without flint; the *White Chalk*, containing flint; the *Maestricht-beds*, rough, friable limestone at Maestricht, in Holland."—DANA.

Messrs. Meek & Hayden, who have explored and studied the Cretaceous Formation in the region of the Upper Missouri, have visited localities in New Jersey, and inspected the results of the late Geological Survey, pronounce our greensand marls to belong to the Later Cretaceous. [See Proc. Acad. Nat. Sci. 1857, 127; 1861, 426.]

and from them inferences regarding the condition of the earth at that time can be drawn with more safety than from any other kinds of organic remains. The fossils of this formation have been extensively collected as objects of scientific interest, and the greater portion of them have been described in the transactions or journals of learned societies. T. A. Conrad, Esq., of Philadelphia, one of the earliest and most diligent of the laborers in this field of research, has prepared a "Synopsis of the Invertebrate Fossils of the Cretaceous Formation of New Jersey," which will be found in Appendix C of the Geology of New Jersey. The remains of fishes, especially the teeth, are very common, but there are no satisfactory descriptions of them. The reptilian remains have lately been made the subject of a Monograph, by Prof. Joseph Leidy, of the University of Pennsylvania. It is published in one of the volumes of the Smithsonian Contributions to Knowledge. For a list of those described, see appendix to the Geology of New Jersey.

CLAY MARLS.

That part of the Cretaceous Formation which is designated by the above name, lies immediately upon the *Plastic Clays* (see figure No. 2), and its outcrop is seen in the belt of country adjoining those clays on the southeast. They have Raritan and Sandy Hook bays on the northeast; on the northwest they follow a southwest line almost straight from Chesquake to Bordentown, and thence onward in a nearly direct line to the bend of the Delaware, below Pennsgrove. On the southwest they border on the Delaware river, and on the southeast they join the Lower Marl Bed, which is fully described farther on.

Their outcrop is characterized by two very distinct varieties of soil, which originate from the strata underneath them. Along the northwestern side, and for nearly half the breadth of the formation, the soil is generally heavy, but retentive and susceptible of a high degree of improvement. The remaining part, being the southeastern portion, is a sandy loam. This soil is admirably adapted to the growth of early crops and market-garden products. Some of the most productive parts of Monmouth, Burlington, Camden, Gloucester and Salem counties are upon this formation.

DESCRIPTION.

In the banks of streams or ravines, on steep side-hills, or in cuttings of roads and railroads where this formation has been long exposed to the weather, it is everywhere characterized by reddish crusts of oxide of iron. Deeper beneath the surface, or where it is always moist, it is composed of beds of dark-colored clay and sand, with more or less of lignite and iron pyrites, but also containing small quantities of greensand irregularly scattered through the clay. The grains of greensand are smaller than grains of gunpowder, the most of them passing through a sieve with meshes 1-150 of an inch in diameter. These grains may vary from black to olive-green upon their surface, but when crushed upon the nail they always show a light-green color. And the same color is always strongly developed in digging, the grains being crushed with the spade.

The formation is well displayed in the cuts on the N. Y. and Long Branch Railroad, north of Matavan creek along the bank at Matavan Point, where there is an exposure of the dark clays and lignite for nearly a mile along the bay-shore. Following the bay-shore below Keyport and Union City, beds of clay marl are indistinctly exposed. Farther on, at the base of the Highlands, the clay containing greensand is entirely wanting, and in rising on the slope up to the Lower Marl Bed, the material passed over is sand, thinly laminated by films of clay. Computing from the breadth of country passed over and the dip of the strata, the formation is two hundred and seventy-seven feet thick, of which the clay and greensand strata make up one hundred and seven feet, and the laminated sands the remaining one hundred and seventy feet. At the shaft sunk in searching for coal east of Jacksonville, the dark clay containing grains of greensand was passed through for fifteen or twenty feet before reaching the white sand of the lower formation. It is also exposed in a ravine on the farm of Enoch Hardy, near the same place. Here and at a number of other places in the vicinity it has been dug for marl. At Ten Eyck Brothers, near Matavan bridge, on turnpike to Old Bridge, a section is exposed in the side of the road descending to the bridge. From the house downwards for thirty feet the material is clayey, but the strata not plainly exposed; then there is a bed of greensand and clay intermixed, five feet thick; next five feet of chocolate-colored clay; below which there is seventeen feet of a black micaceous clay, which descends to the creek.

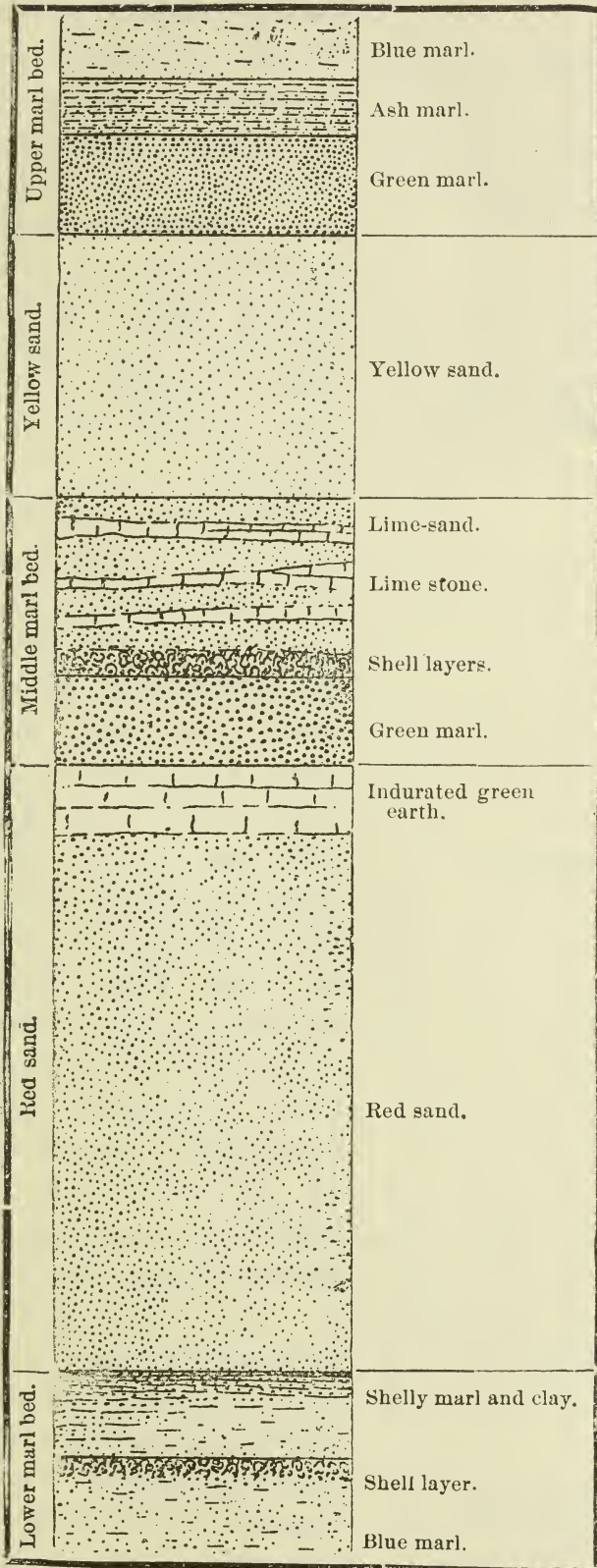
On the straight road from Hightstown to Cranberry, near the Millstone river, it crops out in the road. At Bordentown, near the railroad shops, the dark clay containing greensand is well exposed, and is seen resting on the white sand of the lower formation. It is seen very finely also at the Kinkora brick yard, three miles below. At Shelltown, on Crosswicks creek, the clay and greensand is seen in the south bank by the roadside, while immediately south of this, and along the road up the slope of Red Hill to the Lower Marl Bed, only the laminated sands are to be found. Farther to the southwest, the surface of the country is such that the meeting of the strata of different kinds is not exposed, but there are openings in many places where one or the other of these characteristic strata is exposed. No interest has been attached to the laminated sands, except as the basis of a warm soil suitable for early crops; but there have been many experiments made with the clay and greensand layers, to test their usefulness as fertilizers.

LOCALITIES.—The clay marls have been dug as fertilizers by Enoch Hardy, of Jacksonville, Ten Eyck Brothers, of Matawan; at Texas, east of Jamesburg; Daniel Prest, of Strong's Mills; Charles Craig, in Manalapan; J. J. Ely, two miles west of Perrineville; Henry Taylor, west of Imlaystown; at Waln's Mill; by Miller Howard, at Shelltown; by J. D. Conover, $1\frac{1}{2}$ miles, southwest of Newtown, Mercer county; at Jacksonville, Burlington county; Charleston, Centreton and Irish Wharf, on the Rancocas; by John E. Hopkins, of Haddonfield; C. Grover and Wesley Budd, near Mount Ephraim, Camden county; and Benjamin C. Tatem, below Woodbury, Gloucester county.

The laminated sands can be best seen along the base of the Navesink hills, on the bay side. They can also be seen on the northwest and lower slopes of the Mount Pleasant hills, on the Freehold and Jamesburgh Railroad from Englishtown to the battle-ground, and on the west slope of Red Hill between Monmouth and Burlington counties.

FOSSILS.—Shells and casts of mollusks are found in this formation, though from the much fewer excavations in it, they are not so commonly seen in collections as those from the marl beds. The

FIG. 3.

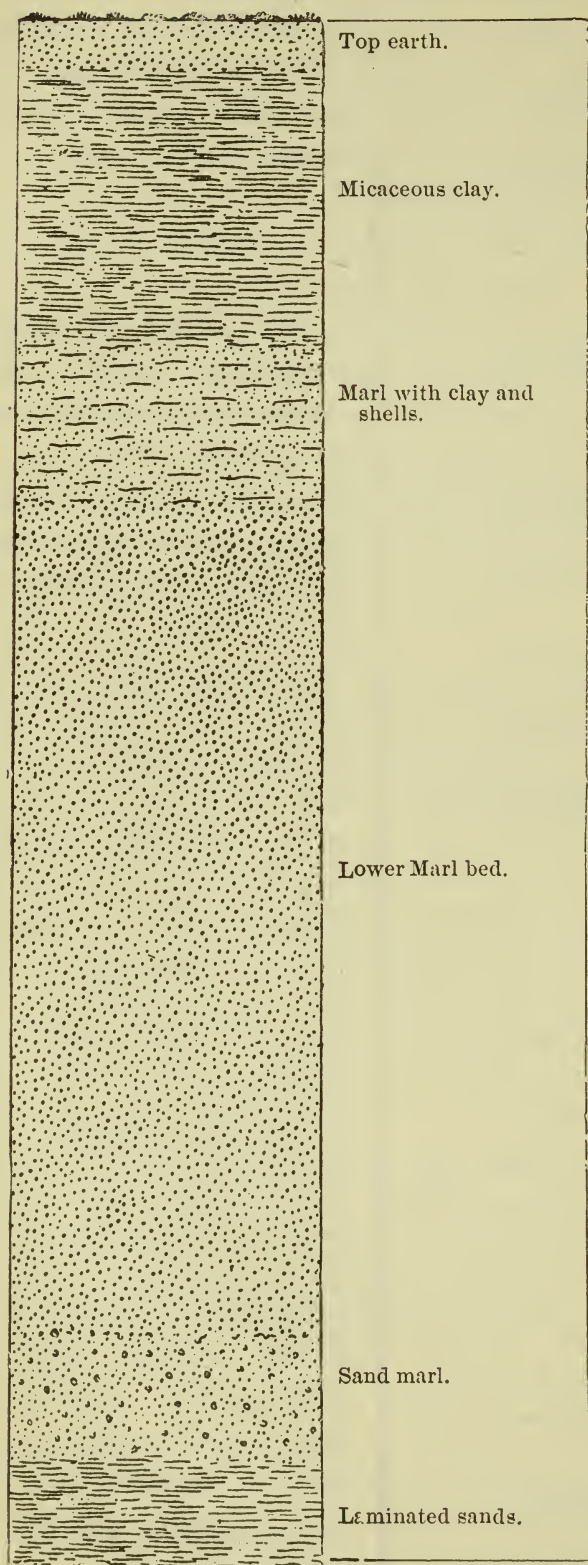


Ammonites Delawaren-
sis *Baculites ovatus*, *Sca-*
phites ———, *Gryphea*
vesicularis, and some oth-
ers have certainly been
found in it.

MARL BEDS.

The series of strata
comprised under this
name, include those beds
of greensand which have
obtained so high a repu-
tation, under the name
of *marl*. The district in
which they have their
outcrop is widely known
as the Marl Region, and
occupies a strip of coun-
try from six to fifteen
miles wide, and stretch-
ing from the ocean below
Sandy Hook to Salem,
on the Delaware. The
soil over this district is
more or less sandy, re-
markably free from
stones and boulders, and
in most parts in a high
state of cultivation and
very productive. When
exposed in natural or ar-
tificial sections several
well-marked beds and
layers can be character-
ized, as detailed in the
accompanying columnar
section, Fig. 3.

FIG. 4.



These several beds having a strike of S. 55° W. and a dip to the southeast of twenty to thirty feet per mile, have their outcroppings in the order of their occurrence, that which is lowest appearing farther to the northwest, and that which is higher in the series farther to the southeast.

Those parts of the bed which are thirty feet above tide appear a mile northwest of the same bed at tide level. Those which are sixty feet above, two miles northwest of those at tide level, and so on. The same principle holds true of the Middle and Upper Marl Beds; their exposure on the surface is in a very irregular line; it is, however, easily explained, being caused by an inequality of heights of the surface in different places, while the dip and strike of the beds are uniform. Wherever the country slopes towards the southeast the outcrop is broad; when towards the northwest it is narrow.

DETAILED DESCRIPTION OF THE OPENINGS IN THE LOWER MARL BEDS.

LOWER MARL BED.—The subdivisions of the Lower Marl Bed are plainly marked in all the eastern part of the State. The columnar section, Fig. 4, on preceding page, shows these subdivisions fairly. It was made from a measured section at the Highlands, on Sandy Hook Bay.

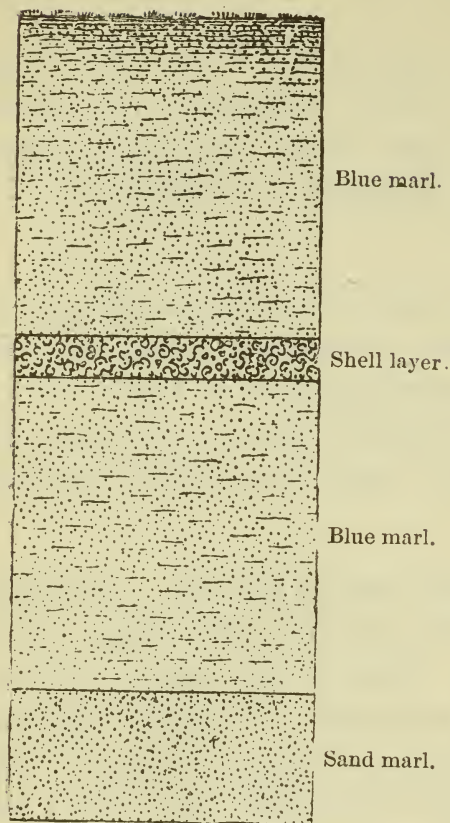
Sand Marl. A layer of open sand with scattering rounded grains or small pebbles of quartz, and a small percentage of greensand. It contains numerous fossil shells, and some phosphate of lime. It is a very distinct layer, and the lines of division between it and the laminated sands below and the blue marl above it are clearly marked. It is from two to four feet thick.

Blue Marl. This constitutes the chief part of the bed. It consists of greensand mixed with a greyish and very fine earth, which makes from 10 to 30 per cent. of the whole. Much of this earth is carbonate of lime. It effervesces strongly with acids. In places where it is worked for marl, and horses or mules are obliged to stand in its mud, it is said to take off the hair from the animals' legs; and I am assured by those who have seen it, that surfaces smeared with the muddy and fresh dug marl give off a pale phosphorescent light. In places where the bed has been exposed to the action of decomposing iron pyrites, the carbonate of lime has been entirely removed, and much of the marl has become black in color and very astringent.

This layer is about sixteen feet thick. Very near the middle of it is a shell bed of from six to twelve inches thick, which is composed almost entirely of valves of *Gryphea vesicularis*. The substance of the shell is still thick and firm, and the shells closely packed in the mass. This layer is a very characteristic feature in the marl-pits about Marlboro in Monmouth county, and it is also plainly seen in some of the pits near Red Bank in the same county, ten miles east of the former place. It has also been recognised in the western part of the State. Fig. 5, on the following page, shows the bed with the shell layer in it, as seen at Uriah Smock's marl-pit at Marlboro, Monmouth county.

Marl and Clay layer. The blue marl at its upper part passes gradually into a layer of a darker color, containing many scales of

FIG. 5.



mica and some dark-colored sandy clay. It also has some shells, particularly the *Ostrea larva*, in thin flaky scales. This layer is ten or eleven feet thick, and at its upper part contains scarcely any green-sand grains. It is frequently found very astringent, or acid from the presence of sulphate of iron (copperas) in it. The change in this layer is very gradual from the bottom to the top; the lowest being a pretty good fertilizer, while the upper is scarcely more than a black sandy and micaceous clay.

Localities.—The following series of marl exposures in the Lower Bed is presented to verify the general statements made above, in regard to structure, and to exhibit the line or belt of country in which the

outcrop of the marl occurs. There are a great number of others which are opened, and it is possible to increase the number until they actually join each other, and the whole distance from Sandy Hook bay to the Delaware river becomes one great marl pit.

At the Highlands, on the shore of Sandy Hook bay, the following section was measured—reddish-yellow, or ferruginous sand of great thickness, lying over the marl :

9 feet of black, micaceous and astringent clay.

5 feet of black clay as above, with some thin and flaky shells.

25 feet of marl, greensand ; the upper part, for three or four feet, mixed with the clay over it, the rest almost free from clay, and consisting of marl grains, fine carbonate of lime, shells, and a little sand.

3 feet sand and small gravel, with marl grains and shells.

42 feet total thickness.

At the old North American Phalanx pits, on Hop Brook, in Atlantic township, Monmouth county, the black clay is seen overlying the marl, but not in its full thickness. The following series of specimens, obtained at the different depths mentioned, were presented by Mr. Charles Sears :

At 6 feet, the sample is an average, and is a micaceous clay, dark-colored, and containing some thin and tender shells, and a few marl grains.

At 9 feet specimen similar to the preceding, but with more marl.

At 12 feet clay, with large percentage of marl grains.

At 15 feet marl without clay, but with some fine carbonate of lime, bluish-gray color.

At 18 feet same as at 15 feet, but of a little darker color.

At 21 feet same as last specimen.

At 24 feet lighter-colored marl than the preceding, and containing a large percentage of fine carbonate of lime.

At 28 feet same as the last specimen.

At 30 feet similar to the last, but a shade darker.

At 32 feet more of a bottle-green color, and the marl grains finer.

At 34 feet same as preceding.

At 36 feet same.

At 38 feet same.

From 21 feet down, the specimens were obtained by boring; the boring terminated in marl.

At the pits at Hartshorn's Mill, a mile and a quarter north of Freehold, the following measurements were obtained :

Near these pits the overlying black clay was found to be 11 feet.

At the pits, commencing at the surface—

3 feet dark micaceous clay, containing shells.

4 feet clay, with shells and numerous marl grains.

6 feet marl, grey, and containing shells and fine carbonate of lime.

15½ feet marl, like the last, though varying slightly in color, some parts being darker and others lighter.

The last distance was bored, and ended in sand, for which, if we add 3 feet, we have a total of 42½ feet.

In Monmouth county, on McCleas creek, Peter J. McCleas digs 20 feet of marl.

Opposite Red Bank, and on the north shore of the Navesink river, Wm. V. Conover digs 3 or 4 feet of greyish and rusty marl, under which he has dug 21 feet in green sand.

In Nut Swamp, Mr. Wm. Smith says that he digs 20 feet in marl; the upper a dry and grey marl, and the lower part is black and astringent.

At Middletown, a fine exposure of the unchanged blue marl is to be seen in the pits of Azariah Conover. He has dug 25 feet in it without finding the bottom.

Along the north slope of the Mt. Pleasant Hills, pits are opened from above Middletown to near Marlboro. The marl is mostly somewhat changed by atmospheric agencies, and by leaching.

At Mt. Pleasant, J. S. Whitlock has marl pits at which a fine section is exposed. Over the marl 14 feet dark micaceous clay, then 4 or 5 feet dark clay and some greensand, 9 feet black marl, 2 feet shells, 7 feet marl to sand-marl.

Near Holmdel, on the farm of the late Peter R. Smock, the blue marl is very finely exposed, and the layer is dug into for 15 or 16 feet, and the best of marl obtained.

On the slope along the north side of Hop Brook, Rev. G. C. Schank has marl exposed, in a section of which 10 feet at the top is a grey marl, then 14 inches of a solid mass of shells; then 9 feet 9 inches of blue marl, under which is 4 feet of sand-marl.

At Marlboro, Monmouth county, Uriah Smock has marl-pits in which he digs 2 feet top-dirt, 2 feet reddish-grey marl, 7 feet blue marl, 2 feet layer of solid shells, 10 feet blue marl, and 3 feet sand-marl.

On road from Freehold to Englishtown, near the old Monmouth battle-ground, Dr. J. Conover Thompson has pits in which he digs 3 feet of reddish-grey marl, then 7 feet black marl, and 4-5 feet blue marl.

On the Manalapan creek, at Black's mills, J. R. Perrine opens the marl layer about 20 feet in thickness.

At Manalapan village, several persons dig into the marl 3 to 6 feet, and then into the sand-marl and underlying sand from 4 to 8 feet.

At Perrineville, Wm. H. Mount's pits showed the following measured section: 2 feet top-dirt, 2 feet sand and reddish-grey marl, 5 feet black marl, 4 feet sand-marl.

Near Imlaystown, Michael Taylor, in digging his well, penetrated the marl.

Nimrod Woodward's pits at Cream Ridge, expose about 12 feet of blue marl, and the sand-marl underneath.

At Arneystown, on the Province line road, and on bank of small stream, the blue marl is dug by G. Lawrie and T. Wiles.

From this part of the bed towards the southwest, the marl is not so highly prized as a fertilizer, the openings into it are much fewer, and consequently the observations and measurements in relation to it much less complete or satisfactory.

On the stream, three-quarters of a mile northwest of Jacobstown, Burlington county, the marl is dug by Michael Rogers and others; it is said to have been penetrated 27 feet,

This marl bed is opened at Georgetown.

On the Rancocas, a half mile below Mt. Holly, Daniel G. Lippincott digs marl from 7 to 20 feet.

At Hainesport, the marl is opened by Barclay Haines; 7 feet sand, greensand and light-drab clay; 7 feet black micaceous marl; then light-colored sand.

A mile and a half south of Moorestown, John T. Davis finds 2 to 3 feet very pure greensand, 5 to 6 feet of sandy-grey marl.

On the Pensauken creek, in Camden county, on the Moorestown and White Horse road, David Davis and Joseph Githens find marl 10 feet deep, the lower 3 feet, being full of large and solid shells.

Bridge Kay finds marl on south branch of Coopers creek, 2 miles from Haddonfield; layer is penetrated 10-15 feet.

On the Camden and Atlantic Railroad, a mile and a half southeast of Haddonfield, J. Gill's marl-pits are located.

At Clement's Bridge, on the Almonesson creek, Gloucester county, the marl has been dug.

The marl has also been dug at Carpenter's Landing.

On Repaupa creek marl-pits have been sunk.

On Raccoon creek, above Swedesboro, the marl has been opened by several persons.

Dr. Charles Garretson's pits, 10 feet in marl.

The marl at Batten's mill has been dug into 16 feet by Zebulon Batten.

John W. Davidson has dug the marl on Church Run 9 feet above level of pond and 16 feet below; marl sandy and of uniform quality.

The bed is opened on Indian Run and other small streams, between Swedesboro and Sculltown.

At Auburn, Salem county, N. Lippincott's marl is exposed for 20 feet above tide-water, and 10 feet below tide.

On the Salem and Auburn road, and on banks of Two-penny Run the marl is dug by Samuel Borden and others.

On lands formerly of Joseph Basset and Wm. Slape, near Marshallville, the marl is dug. It is covered by about 5 feet top-dirt, then 12 feet marl, and then sand.

RED SAND BED.

RED SAND.—This name is applied to the bed of sand, with its subordinate members, which lies immediately over the Lower Marl Bed. In the Geological Report of 1854 it was named the Ferruginous Sand Bed, but as that name has formerly been applied to all the sands of the Cretaceous Formation, this more specific and characteristic name has been substituted. It is from one hundred to one hundred and ten feet thick. The mass of the bed is composed of a very ferruginous and red sand. At some former time this sand must have been almost white, for in many places nodules or tubes of stone are found, which on the outside have the usual red color, but on breaking them open they are found filled with white sand. Indeed, all the circumstances indicate that at some time since its deposition water, containing some salt of iron in solution, has filtered through it everywhere and discolored it, except in those places where the iron solution has absolutely cemented the sand into stone, and so formed a protecting coat for those parts which had not before been penetrated.

The lower part of this bed, from ten to twenty feet thick, is a dark-colored, sandy and astringent clay. The coloring matter of this portion of the bed is protoxide of iron, and it only needs to be changed to a peroxide to become as strong a red in color as the rest of the bed, and, in fact, such a change has taken place in many localities, so that this part of the bed cannot be distinctly traced.

The upper portion of this bed, which lies immediately under the Middle Marl Bed, is composed of a greenish indurated earth, in many places firm enough to be considered as rock. In some places in the southwestern part of this formation it is not indurated, and, being green in color and containing some phosphoric acid, farmers have

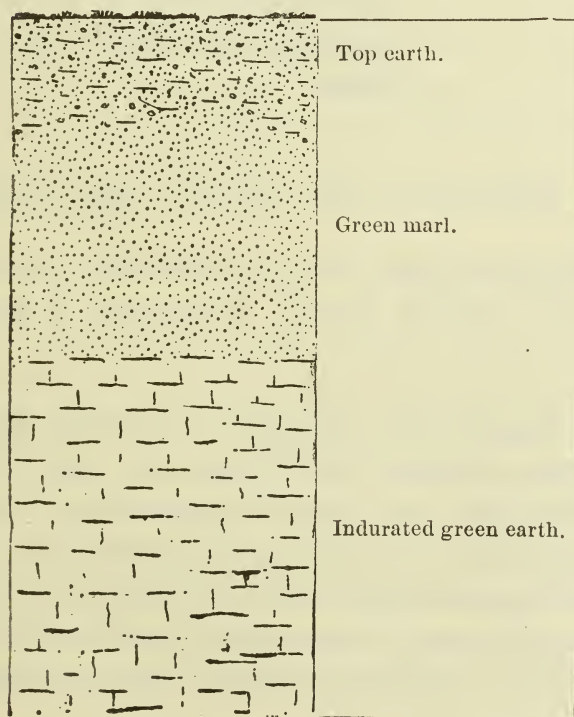
used it as a fertilizer with profit. Where exposed, it varies in thickness from ten to twenty-five feet. It is separated by a well-defined line from the Middle Marl Bed, but below it passes insensibly into the Red Sand layer.

LOCALITIES.—Navesink Highlands, on shore of Sandy Hook Bay, Monmouth county; hills near Red Bank; deep cut on the New York and Long Branch Railroad, and on the New Jersey Southern Railroad; deep cut on Holmdel and Keyport turnpike; Beacon and other of the Mt. Pleasant Hills; Sugar Loaf Hill; Freehold; Timmons Hill; Cream Ridge; Red Hill, between Shelltown and Arneystown; Arneys Mount and the mount at Mount Holly, Burlington county; banks of Big Timber creek, near Chew's Landing, Camden county; banks of Mantua creek, above Carpenters Landing, Gloucester county; Richards Hill; Mullica Hill; banks of Oldman's creek, above Auburn; and the banks of Salem creek, below Sharptown, Salem county.

The black micaceous sandy clay which constitutes the lower part of this bed has been sufficiently referred to in the localities of the Lower Marl Bed.

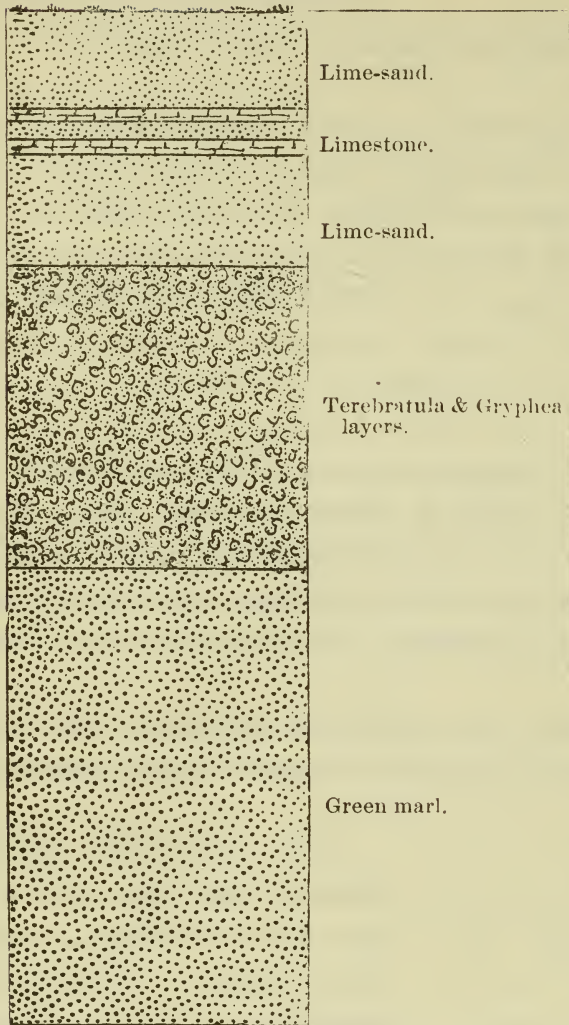
The Red Sand Layer, which is the principal member of the Red Sand Bed, is to be found in all the localities given in the preceding list.

FIG. 6.



The Indurated Green Earth is dug for a fertilizer by J. P. Lafetra, near Shrewsbury, Monmouth county; it forms the ledge over which the water flows at Tinton Falls; the rocky masses at the deep cut on the Holmdel and Keyport turnpike are of this layer; it is the green clay south of West Freehold, at Clarksburgh, on the Province Line road below Arneystown, near Jacobstown, Burlington county; what is called "green land" in Camden, Gloucester and Salem

FIG. 7.



counties, is the outcrop of this layer. Mr. Benjamin Lodge, near Carpenter's Landing, digs this indurated earth as a marl. The solid masses of large shells imbedded in green material, seen at the roadside on Richards Hill and in the bank at Mullica Hill, are also of this layer. It is softer in substance, and is dug as a fertilizer by Mr. Robinson, on Major's Run above Sharptown.

Figure 6 on the preceding page shows this green earth as it is dug by some of the farmers along the brook above Tinton Falls, in Monmouth county. The green marl overlying it is the bottom of the Middle Marl Bed.

DETAILED DESCRIPTIONS OF OPENINGS IN THE MIDDLE MARL BED.

MIDDLE MARL BED.—The bed of green sand to which this name is applied, is composed of three distinct layers. Its section is well shown in Figure 7.

Green Marl Layer is an almost pure greensand, containing but few white shells, though casts of shells, fossil-bones, etc., are not uncommon. Where it has not been worn away by denudation, it is fully fifteen feet thick. At bottom it terminates in the most part of Monmouth county upon the indurated green earth of the Red Sand Bed. Farther towards the south-west it terminates in a chocolate-colored earth or clay, into which it gradually passes. At the upper

part it terminates in a layer of white shells, mixed with greensand, which constitutes the

Shell Layer. In a few places these shells have been dissolved out by the action of sulphate of iron, or other agency, and only the impure greensand is left when the line between this and the preceding layer is difficult to determine. When unchanged this layer is white with shells, principally those of the *Gryphea vesicularis* and *Terebratula Harlani*, which are so thickly imbedded in the greensand as to make half the substance of the mass. It varies from four to seven feet thick with an average of five feet. The lower two-thirds consists of the *Gryphea* with scarcely any other shells intermixed. The upper third is almost entirely composed of shells of the *Terebratula*. This remarkable and plainly distinguished layer is found developed for the whole hundred miles in which this bed is exposed in New Jersey.

The *Yellow Limestone* or *Limesand Layer*, is the upper layer of the Middle Bed. It is a mass of crumbled corals, sea-eggs, and other calcareous matters, with a small per centage of quartzose sand, and scattering grains of greensand. In Monmouth county it is always soft and crumbling, but in Burlington, Camden, Gloucester and Salem counties the lower part is in layers of a stony hardness, with layers of the softer materials interposed. This was called the Yellow Limestone by Prof. Rogers, and is much more fully developed in the States farther to the southwest. In Salem county it has a thickness of 25 feet, but has not been seen quite so thick in any other place.

LOCALITIES.

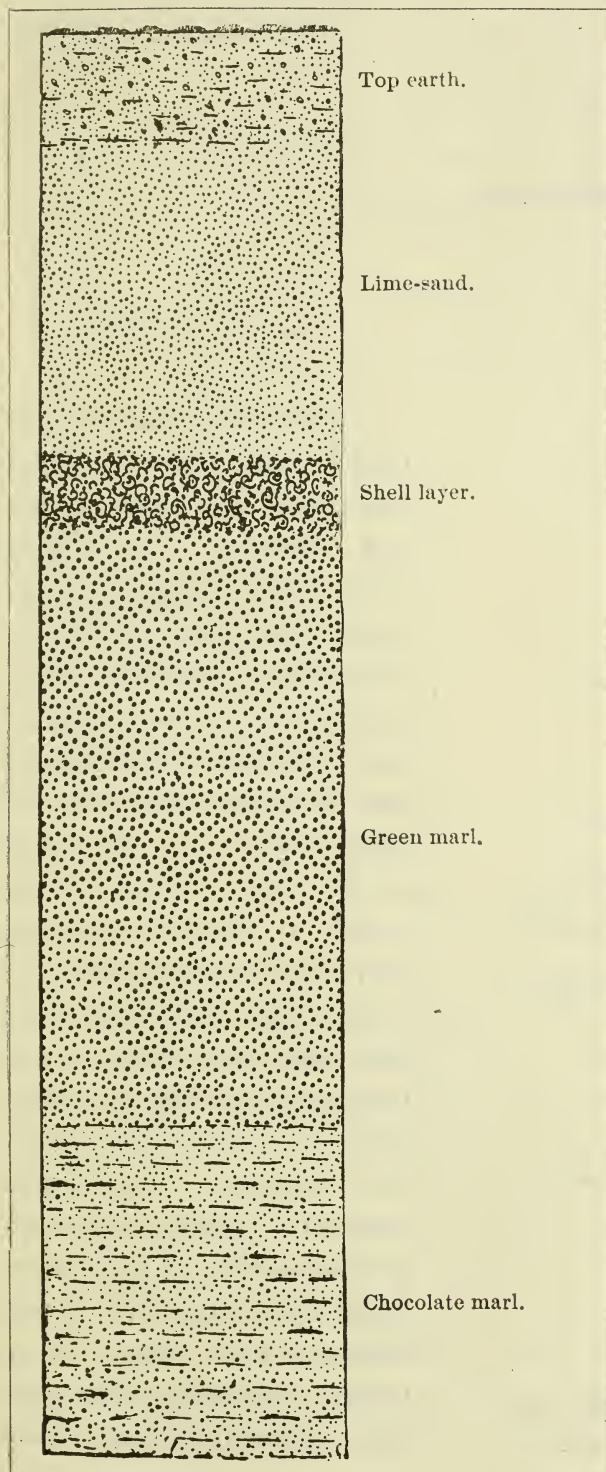
In Monmouth county, on the beach at Long Branch, masses of the cemented corals and other calcareous matter, also masses of cemented greensand, are almost always to be found. At the Turtle mill, between Eatontown and Long Branch, the limesand and part of the shell-layer are dug into eight or ten feet. Peter Casler, of Town-neck, has a pit in the green marl which he has dug into for eighteen feet. The limesand is dug on Mr. Wolcott's land, on the road from Eatontown to Shark River; near Eatontown Geo. A. Corlies digs ten feet, and has bored seven feet deeper—shell-layers about two feet thick and

four feet below the surface, then eleven feet of green marl, without finding bottom; at Tinton Falls, Pierson Hendrickson digs ten feet into the marl; Robert W. Cooke digs from four to six feet deep of the bottom of the green marl. About half a mile south of Colt's Neck the marl is dug by several individuals; John Van Mater digs twelve feet in it; at Pyle's Corner the green marl layer is dug into thirteen feet. About a mile southwest of Blue Ball several pits are open; J. Shepherd digs ten feet in green marl; H. Brinckerhoff digs about five feet in shell-layer, and thirteen or fourteen feet in the green earth; John and Thomas Strickland have pits in which a part of the limesand, the shell-layer and the top of the green marl are exposed. The bed is opened at Smithville and at Burnt Tavern.

Near Prospertown, on the Lahaway creek, Ocean county, the following section was measured in the pit of Van Hise, two feet top-dirt, four feet reddish marl, one inch iron-stone, one to three feet black marl, ten to twelve feet hard green marl; at Hornerstown, John Goldy's pits have three feet top-dirt, one foot reddish marl, and eleven feet green marl, chocolate marl at bottom. At the bank on Samuel Horner's estate, at New Egypt, there is exposed two feet top-dirt, nine or ten feet of limesand, seven feet of shell-layers, and fourteen feet of green marl. The limesand is opened at Cookstown; at Messrs. Black's, in Springfield, the marl is dug fourteen or fifteen feet deep; at Juliustown the bed is opened in several places; the marl pits of the Pemberton Marl Company are situated at Pemberton; they dig three or four feet top-dirt, three feet grey marl, eleven feet black marl, eight feet green marl, chocolate marl to bottom. Along the south branch of the Rancocas the whole bed is exposed in the successive openings between Vincentown and Eayrstown, the limesand and yellow limestone in the pits farthest up stream, the shell layers in the next pits below, and the green marl in the pits farthest down the stream; the same order of layers is also seen along Haines' creek. West of Medford, along Sharp's run, there is also a very fine exposure of the marl, from fifteen to sixteen feet of the green layer having been dug into; at Marlton, the pits of Samuel Brick, in which the green layer for thirteen feet and down to the chocolate marl is exposed, gives a good example of the openings in that vicinity. Passing the openings on every stream between Marlton and White Horse, in Camden county, at the latter place, in the pits of Minor Rodgers, six to thirteen feet of green marl are

passed through and the chocolate marl reached. On the north branch of Big Timber creek the marl is dug at Brownsville, and at Laurel Mill Ephraim Tomlinson has in his bank full thirty feet of

FIG. 8.



the bed—the limesand and yellow-limestone above, then the shell-layers and the green marl. At Blackwoodtown the whole bed can be seen, by going along up the stream from Good Intent towards the southeast; David E. Marshall's pits, shown in Fig. 7 (page 66), are good examples of the bed, having on top six to twelve feet red or gray marl, seven feet pale-green marl, and from eighteen to twenty feet of green marl, and then chocolate marl. On Mantua creek there is an unusually fine exposure of the whole bed; in the long line of pits of the Messrs. Heritage (Fig. 8), at Hurfville, they show this section:

Top-dirt.....	2-6 feet.
Limesand.....	9 "
Yellow limestone..	3 "
Terebratula layer.	2 "
Gryphea layer.....	2 "
Green marl.....	13 "
Chocolate marl....	...

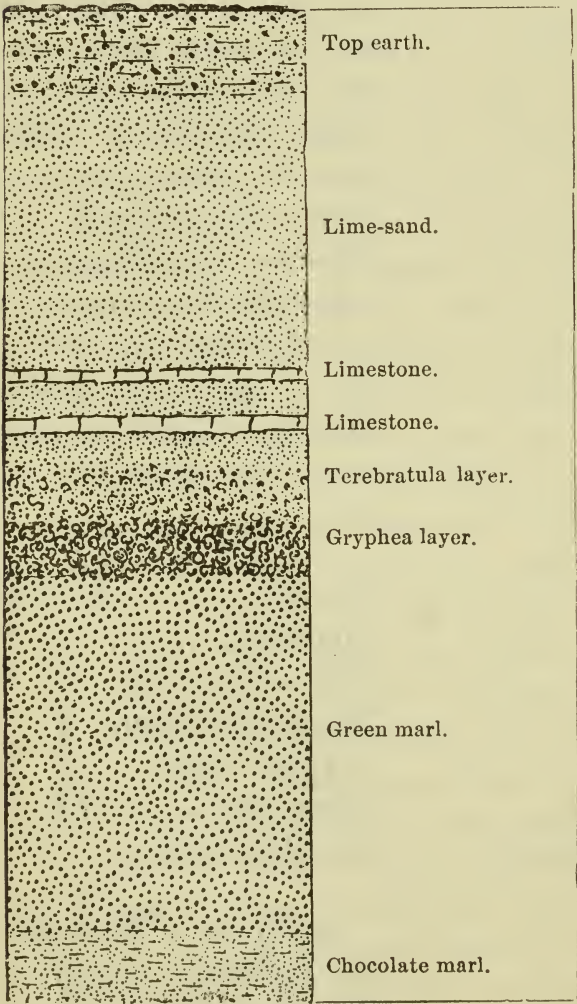
Southeast of Barnsboro, in Gloucester county, on the south branch of the

Mantua creek, are important marl pits, one of which is worked by the West Jersey Marl Company, in a layer containing twelve feet of green marl. Along both branches of Raccoon creek the marl is also well exposed in the several layers.

N. T. Stratton's pits here show the following sections :

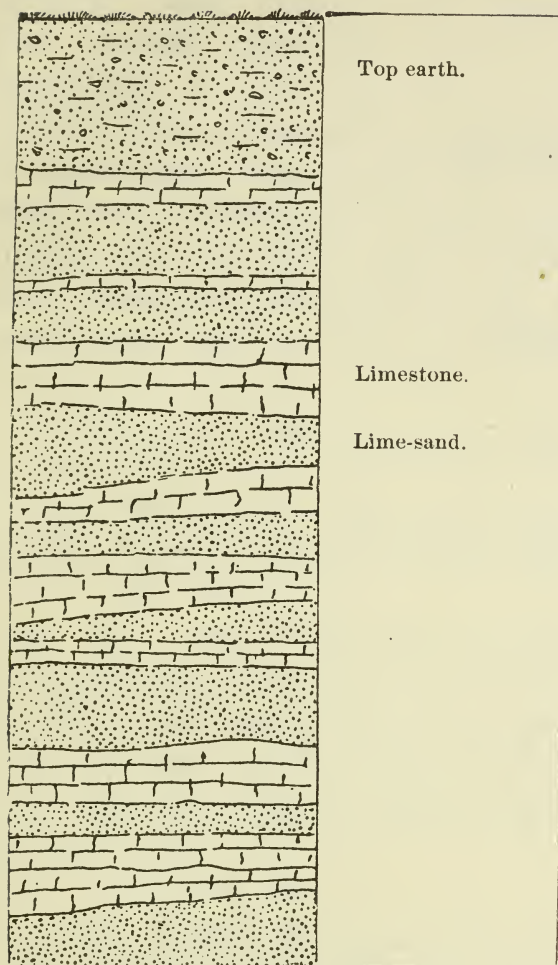
Grey calcareous marl.....	3 feet
Grey limestone.....	$\frac{1}{2}$ "
Grey calcareous marl.....	$\frac{3}{4}$ "
Grey limestone.....	$\frac{1}{2}$ "
Grey calcareous marl and greensand.....	3 "
Shell layers.....	4 "
Pale green marl.....	6 "
Best green marl.....	12-16 "
Chocolate marl.....	

FIG. 9.



At Harrisonville, on Old-man's creek, there are good sections of the layer shown and worked; in Salem county, on branch of Old-man's creek, near road from Woodstown to Mullica Hill, the layers of limesand, yellow limestone, shell-layers, and the green marl, are all finely shown in a thickness of 28 feet; along Salem creek, at Woodstown, the marl has been worked very extensively; on Nikomus Run, the whole bed is exposed and worked by many persons. The following section is shown : 9 feet lime-sand and yellow limestone; 4-6 feet shells, 15 feet green marl, chocolate marl; along Major's Run there is a similar section exposed, and the chocolate marl was

FIG. 10.

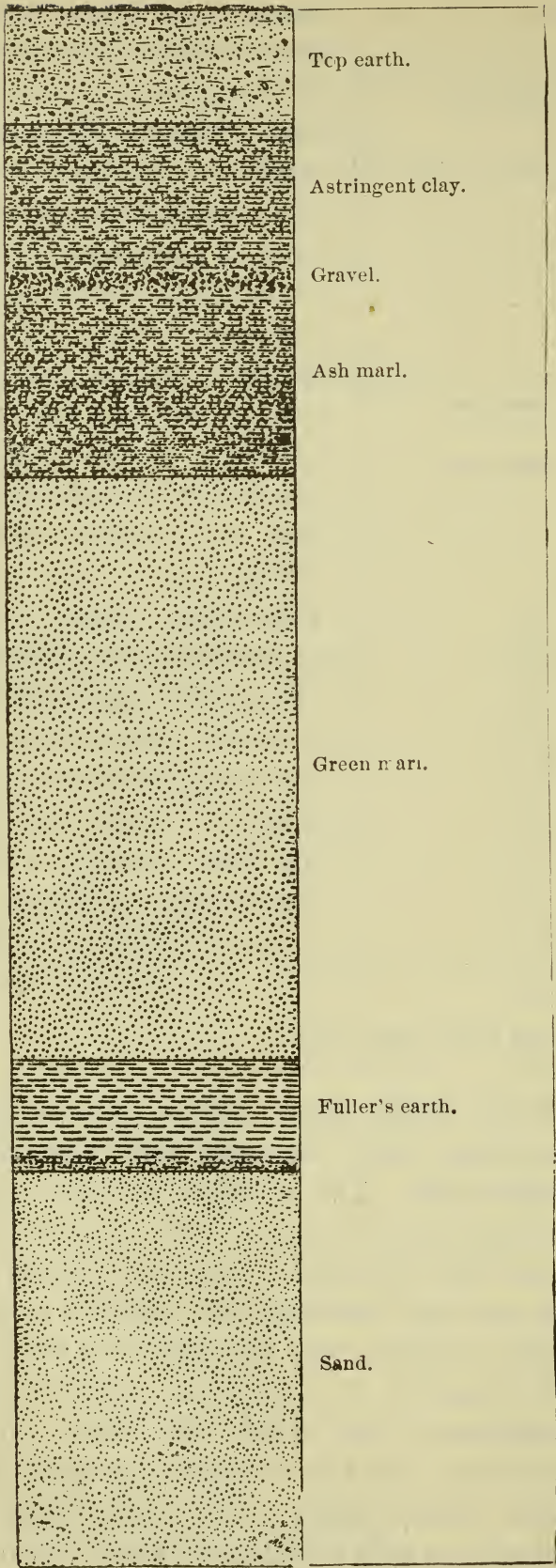


found to be 8 feet thick in Samuel Prior's pits; Messrs. Pettit and several others dig marl along Mannington creek and its branches; a section in Pettit's marl measured in greensand 18 feet, in shell-layers 4 feet, and in limesand 20 feet; William Barber's yellow limestone quarry exhibits the finest exposure of this layer in the State; he has dug 25 feet in it without finding bottom; it is made up of alternating tabular masses of limestone and limesand, (Figure 10,) the stone from 4 to 12 inches thick, and the limesand from 8 inches to 2 feet; beyond these, marl has been found in various places quite to Salem, but as yet in limited quantity.

YELLOW SAND BED.

The limesand layer of the Middle Marl Bed, at its upper part, becomes more and more mixed with quartzose sand,³ and finally changes into the Yellow Sand Bed. This contains, in many places, a very slight sprinkling of greensand granules; and in a few places in Eastern Monmouth it has been observed to have just enough of a greenish clay to make it pack well and form an excellent material for road making. Generally, however, only the sand is to be found, and as fossils have not been found in it, there is no means of identifying it except by its relation to the Middle Marl Bed. In the eastern part of Monmouth county this bed is between forty and fifty feet thick; but in Camden county, which is its southwestern extremity, as far as determined, it is only from ten to twenty feet thick.

FIG. 11.



LOCALITIES.—Along the beach, between Long Branch and Deal, in Monmouth county, sand with a small percentage of greensand granules is found; near Oceanville, William P. West has dug 2 feet greenish clay and 25 feet sand of pale-green color, under which is sand just like that of the sea-beach; Rulief P. Smith digs it as a fertilizer; the very sandy green clay near Maps' Mill, on Whale Pond creek, is of this layer; the same quality of clay is found at the brick-yard south of Tinton Falls, on land of William Marshall; beneath the marl layer of the upper bed at Shark River, sand with a little greensand intermixed is found; at the pits of the Squankum Marl Company, after digging through the marl and fuller's earth, dug 6 feet and bored 16 feet, all in sand, containing green and dark brown grains. Figure 11 shows this

section at the Squankum Marl Company's pits. In the central portion of the state the superficial deposits of a recent date, together with the unsettled country, render it difficult to trace this layer accurately.

Near the Ocean county line, at the end of the bridge on road south of New Egypt, and one mile from that place, the yellow sand is found; near Pemberton, Burlington county, this sand is also to be found, and is dug into for marl; at Medford, in the marl-pits along the brook the Upper Marl Bed is dug through, and after passing the fullers' earth, a layer of sand with grains of marl is found.

DETAILED DESCRIPTION OF THE UPPER MARL BED.

UPPER MARL BED.—This bed of greensand is about thirty-seven feet thick and is composed of three very distinct layers.

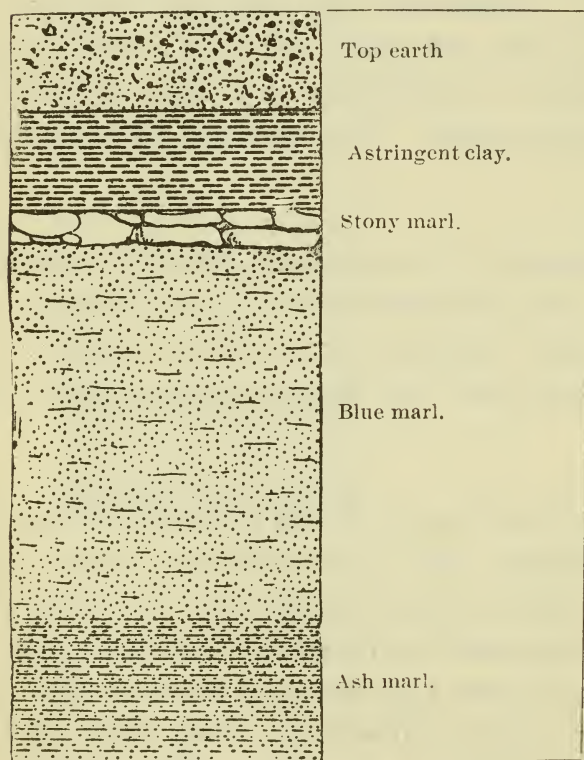
The Green Marl. The Squankum marl of Monmouth county is a good sample of this layer; it is seventeen feet thick, and is almost all pure greensand, containing but few fossils and only a small percentage of clay. At the bottom it terminates in a kind of white earth called white-marl or fuller's earth. It is overlaid by the ash-colored marl.

The Ash-Marl is not a greensand; it is composed of very fine sand mixed with a greenish-white clay, stratified and flaky in structure; it is very uniform in composition; scarcely any fossils are known in it. The heaps of this marl look much like heaps of ashes, hence its name.

The Blue Marl. This layer lies directly on the ash-marl, without any well-marked line of division, and it is terminated above by surface-sand and loam, or by what is called *rotten-stone*; it is eleven feet thick; it is a mixture of greensand and light-colored earth; the upper two or three feet are quite hard and stony, so much so that it sometimes takes two or three years exposure to bring them to a proper degree of fineness for agricultural purposes. Though lying conformably on the layers beneath its fossils are quite distinct and are pronounced by paleontologists to be of the Eocene division of the Tertiary Age.

LOCALITIES.—In Monmouth county, at Deal, between the sea-shore road and the ocean, there is a series of marl-pits in which all these layers are exposed; beginning at the north and going south, Rulief Smith's pits are in the green marl, G. Hendrickson's in the ash-marl, and Abner Allen's in the blue marl, eight feet. Along Poplar Brook the green marl is extensively worked; J. Gardner dug into it sixteen feet, and it is of nearly equal thickness in the pits of J. Howland and others. The blue marl is found eight feet thick south of Poplar, about the head of Long Pond; and west on lands of S. Kirby and others. The ash-layer is ten feet thick. Along Shark river the bed is cut by the stream and the several layers exposed. Hugh Hurley digs eighteen feet in the green layer; Geo. W. Shafto has dug ten feet in the ash-layer; J. T. L. Tilton has nine feet of the blue marl. Fig. 12 is a section of Tilton's marl-pits. It shows the stony layer which lies at the top of the blue marl, and separates it

FIG. 12.



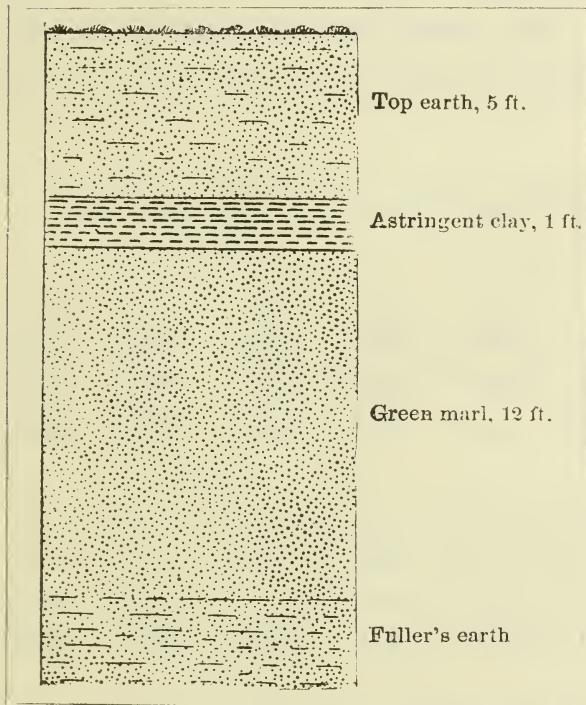
from the miocene or astringent clay which lies on it. Along the Mingum-hone, at Farmingdale, the whole green layer, to a depth of from 12 to 15 feet, is opened in the pits of the Squankum and Freehold Marl Company; farther down the stream the ash-marl is opened and dug through to reach the green layer below. On the Manasquan river are located the diggings from which most of the noted Squankum marl has been taken; on the north side J. B. Williams, E. K. Johnson, W. Johnson, Benjamin Reed, are on the green

marl; Mrs. Allaire on the ash-marl; on the south side, Messrs. Johnson, T. Longstreet, D. Longstreet, C. Matthews, T. Windsor, dig in the green marl, and J. S. Forman and Mrs. J. P. Allaire in

the blue and ash-marls; the whole green marl is from 13 to 15 feet, the ash-marl 8 to 12 feet, the blue marl 12 feet. On Timber Swamp, at the Old Manasse Mill, are located the diggings of the Squankum Marl Company, where the section is from 4 to 10 feet top-dirt, from 4 to 6 feet ash-marl, 15 feet of green marl. From the Manasquan river to New Egypt, in Ocean county, this bed of marl has not been opened. The country is mostly uncleared and the ground elevated, so that the bed is not so easily reached as in other sections.

The outcrop of this bed is about two miles southeast of New Egypt; only the green marl is found. Diggings are opened on the Wiles, Irons and Bussem farms, and the bottom when reached is in fuller's earth; at Poke Hill, in Burlington county, Samuel E.

FIG. 13.



Emley and others dig marl in this bed, finding the green and ash-marls. Mr. Emley, digging 12 feet green marl, (see Figure 13 for Emley's pits,) and Joseph Emley, at Hockamick Mills, digs through the ash-marl. The bed is opened in a large number of places, along the head-waters of the streams which form the Rancocas; above Pemberton it is well seen in the pits of J. Forsyth, S. Shinn and B. Shreve; along the creek both the ash-marl and the green are exposed in the pits of Dr. J. P.

Coleman, Isaac Hilliard, and others; above Vincentown the marl is found on the several branches which unite to form the south branch of the Rancocas; the Vincentown Marl Company's pits are in this bed; along the Jade Run both the ash-layer and the green marl are dug, and also on Ash Run where the most extensive diggings are made; near Chairville it is worked in the green layer; on Haines' creek, at Medford, and up to Oliphant's and Christopher's saw-mills, the green marl is worked; it is from 8 to 15 feet thick, and termin-

ates in fuller's earth; at Clementon is the most southwesterly exposure of the bed which has yet been found; it is in the pits of Hamilton Adams, George Lippincott and James Tomlinson, and has been dug 6 or 7 feet.

COMPOSITION OF THE GREENSAND MARLS.

MECHANICAL ANALYSES OF GREENSAND AS TAKEN FROM THE MARL BEDS.—Under this head are given the results obtained by washing and sifting marls so as to determine the per centage of greensand grains, of clay and mud, and of sand and gravel. The work was done by stirring up the marl thoroughly in water, and then pouring off the turbid water and leaving the washed grains of marl with the sand and gravel. The water was left to settle and the sediment was dried and weighed. The washed marl was also dried, and the gravel and sand sifted out or picked out by hand and the two parts weighed separately.

Examination of six samples of marl from the Lower Marl Bed :

	1	2	3	4	5	6
Greensand.....	58.4	75.0	65.0	52.5	40.8	25.6
Clay, etc., (sediment)....	33.6	25.0	15.6	25.0	32.0	36.0
Quartz sand.....	6.6	.....	2.5	18.7	27.2	38.4
Iron crusts.....	0.7	.....	.....	.....	.....	.....
Shells, in pieces.....	0.7	.....	.....	.....	.....	.....
Chocolate-colored clay... ..	.....	.....	16.9	3.8	.....	.....
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	100.0	100.0	100.0	100.0	100.0	100.0

- 1 From Rev. G. C. Schenck, Marlboro, Monmouth county—a carefully averaged sample.
- 2 From John R. Perrine, Manalapan.
- 3 From John R. Perrine, Manalapan.
- 4 Wm. H. Mount's marl, Perrineville—an average sample.
- 5 From Marshallville, Salem county, pits of the late Jos. Basset—an average sample.
- 6 N. Lippincott, Auburn—an average sample.

Examination of thirteen samples from the Middle Marl Bed :

	1	2	3	4	5	6	7
Greensand.....	82.0	81.2	84.2	90.3	88.5	71.4	77.3
Clay, etc	17.2	17.2	15.8	7.8	11.5	28.6	21.1
Quartz.....	0.8	1.6	.....	1.9	.....	.....	.....
Iron crusts.....	.....	.....	.....	.....	.....	.....	1.6
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

	8	9	10	11	12	13
Greensand.....	91.3	89.0	71.1	28.7	86.6	74.3
Clay, etc.....	7.8	11.0	28.9	17.2	12.5	21.8
Quartz.....	0.9	.....	.....	50.0	0.9	3.9
Iron crusts.....	.....	.....	.....	4.1	.....	.....
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	100.0	100.0	100.0	100.0	100.0	100.0

- 1 From Robert W. Cooke, Tinton Falls, Monmouth county—average.
- 2 From Charles Bennet, Blue Ball, Monmouth county.
- 3 From Charles Bennet, Blue Ball, Monmouth county—red marl.
- 4 From S. R. Gaskill, Pemberton, Burlington county—average.
- 5 From Lawrence W. Jones, Medford, Burlington county—average.
- 6 From Inskip's Bridge, Burlington county—average.
- 7 From Minor Rodgers, White House, Camden county—average.
- 8 From W. J. Marl Company, Barnsboro, Gloucester county—average.
- 9 From Thomas J. Heritage, Hurffsville, Camden county—average.
- 10 From David E. Marshall, Blackwoodtown, Camden county—average.
- 11 From David E. Marshall, Blackwoodtown, Camden county—average, red.
- 12 From N. T. Stratton, Mullica Hill, Gloucester county—average.
- 13 From Dickinson's pits, Woodstown, Salem county—average.

Examination of two samples from the Upper Marl Bed :

	1	2
Greensand.....	67.6	16.6
Clays, etc.....	28.8	33.6
Quartz.....	3.6	49.8
	<hr/> 100.0	<hr/> 100.0

1 From J. & S. Butterworth, Vincentown, Burlington county.

2 From George Lippincott, Clementon, Camden county.

Examination of three miscellaneous samples :

	1	2	3
Greensand	73.4	66.6	31.9
Clay, etc.....	26.6	32.	20.3
Quartz.....	.....	1.4	47.8
	<hr/> 100	<hr/> 100	<hr/> 100

1 Chocolate marl, John Brown, Bally Ridge, Burlington county.

2 Substance used as marl by John P. Craig, Glendale, Camden county.

3 Substance used as marl by Joseph Robinson, Sharptown, Salem county.

MARL GRAINS,

Mineralogically known as Greensand, or *Glauconite*, which is found in considerable quantity in all the marl beds and in the clay marls, is a mineral substance in the form of irregular rounded grains, of a green color, varying from almost black through olive to a light green. Some of the grains seem harder than others, but any of them can be easily crushed between the thumb-nails. The powder produced by crushing is always light green. As the marls are found, they are mixed with clay, fine carbonate of lime, quartz-sand, small pebbles, fossil-shells, etc. To examine the grains more carefully, samples of two pounds each were taken, one from the Clay Marls, one from the Lower, one from the Middle, and one from the Upper Marl Bed. The sample of clay marl was taken from near Ten Eyck Brothers, at Matavan, Monmouth county; that from the Lower Bed from the marl-pits of O. C. Herbert, at Marlboro, Monmouth county;

the Middle Bed sample was taken from the marl-pit of David E. Marshall, of Blackwoodtown, Camden county; and that of the Upper Bed, from the pits of E. K. Johnson, of Squankum, Monmouth county. They were thoroughly stirred up in water and the muddy fluid decanted. This operation was repeated until the washing water was no longer turbid. The water from each was allowed to stand until it had settled clear, when it was poured off, and the muddy sediment was dried and weighed. The washed greensand was also dried and then sifted through a sieve with meshes one-thirtieth of an inch square. This took out quartz grains, lumps of marl, fragments of shells, etc. The sifted portion was again sifted in a sieve, with meshes $\frac{1}{100}$ of an inch square. That which passed this sieve was then separated by a sieve with meshes $\frac{1}{150}$ of an inch square; that is, the whole marl was sorted into

1. Fine Mud.
2. Grains less than $\frac{1}{150}$ of an inch in diameter.
3. " between $\frac{1}{100}$ and $\frac{1}{150}$ of an inch in diameter.
4. " " $\frac{1}{30}$ and $\frac{1}{100}$ " " "
5. " more than $\frac{1}{30}$ " " "

Percentage of fine sediment and of different sized grains obtained by washing:

	1	2	3	4	5
	Mud.	Grains less $\frac{1}{100}$ of an inch.	Between $\frac{1}{100}$ and $\frac{1}{150}$	Between $\frac{1}{30}$ and $\frac{1}{100}$	More than $\frac{1}{30}$
Clay Marl yielded.....	73.	22.	4.	.5	5.
Lower Marl yielded.....	31.	6.	11.	48.	4.
Middle Marl yielded.....	22.	1.	7.	67.	3.
Upper Marl yielded.....	22.	19.	32.	25.	2.

The grains were carefully examined with a magnifier, and those which appeared the purest were taken for further examination.

Of the Clay Marl, grains No. 3 was thought the purest, and was used for taking specific gravity, and for analysis. Scarcely any quartz grains could be seen in it, but it contained particles of a reddish-brown clay, perhaps one-twentieth of the whole. Part of the grains in this marl were of a dull surface and of a lighter green color.

Of the Lower Marl grains, those of No. 4 were the purest, and were used for analysis, and in taking specific gravity. They contained a few quartz grains, fragments of shells, and a little greyish clay, altogether not more than two or three per cent. The grains are black, shining, and slightly brittle.

The Middle Marl grains, No. 4, were the purest, and were the ones afterwards examined. They were almost absolutely free from any foreign substances. The grains were olive-green, somewhat shining, but crushed easily.

The Upper Marl grains used were from No. 3, they being the freest from little grains of quartz, which was the principal impurity seen. They were of a brighter green than those from either of the other beds, and decidedly harder than those from the Middle Bed.

The specific gravity of greensand grains from the

	No. 3.	No. 4.
Clay Marls.....	2.62	
Lower Marl Bed.....	2.78	2.83
Middle Marl Bed.....	2.77	2.80
Upper Marl Bed.....	2.67	2.76

Chemical analyses of the four samples of washed and sifted greensand : A, is from the Clay Marls ; B, from the Lower Marl Bed ; C, from the Middle, and D, from the Upper. The analyses were made by John C. Smock in 1864-5. The determination of the amounts of protoxide and peroxide of iron was made by E. H. Bogardus, in 1868. On account of the green color of the mineral, it has generally been assumed that all the iron was in the state of a protoxide, and these examinations for the peroxide were made at the suggestion of Profs. Dana and Brush, and the result shows that nearly four-fifths of the iron is peroxidized.

	A	B	C	D
Silica	38.500	42.800	45.850	47.100
Protoxide of iron.....	4.260	3.729	2.981	3.717
Peroxide of iron.....	20.967	17.429	17.114	16.801
Alumina.....	6.404	6.022	7.889	5.726
Lime.....	1.069	2.016	1.210	1.979
Magnesia	2.136	2.047	2.514	2.888
Potash	8.190	7.998	8.084	7.010
Sulphuric acid.....	0.343	0.343	0.274	0.721
Phosphoric acid.....	1.153	1.409	1.729	1.025
Water lost at heat of 212°....	6.020	4.075	3.266	4.760
Water lost at heat above 212°..	3.808	3.916	4.835	4.152
Quartz.....	7.700	6.990	4.300	4.100
	<hr/> 100.550	<hr/> 98.685	<hr/> 100.116	<hr/> 99.979

To the preceding analyses of greensand made by J. C. Smock, we add the following made by Julius Koch, and published in the Geological Report of 1856 :

They are of clean grains of greensand. The specimens were first prepared by washing out all clay and muddy substances that could be kept suspended in water; then drying the remaining matter at about a summer heat; and afterwards carefully picking out the grains of greensand from the particles of quartz, phosphate of lime, and other substances with which they were mixed. After all the trouble taken, however, it will be perceived that there was a small quantity of sand and phosphate of lime left with the grains. The computation for peroxide of iron has been made from the examinations of 1868, and no attempt was made to determine the amount of water lost at a temperature below 212° *F*.

On the samples analyzed, E is from the Lower Marl Bed; F from the Middle; and G from the Upper.

	E	F	G
Silica	45.510	50.010	41.729
Protoxide of iron.....	3.842	3.840	3.023
Peroxide of iron.....	19.020	19.008	14.964
Alumina.....	7.960	7.368	5.929
Lime.....	3.842	.312	8.026
Magnesia	2.460	2.866	2.938
Potash.....	6.748	7.370	6.066
Sulphuric acid.....	1.129	.430	1.005
Phosphoric acid .....	.993	.628	7.356
Carbonic acid .....	.563	.000	1.383
Insoluble silica (sand).....	.850	.402	.909
Water	7.382	7.746	6.308
	<hr/> 100.299	<hr/> 98.980	<hr/> 99.636

An inspection of the above results of analysis shows that the silica, peroxide of iron, protoxide of iron, alumina, magnesia, potash and water are very uniform in amount, while the lime, sulphuric acid, phosphoric acid, carbonic acid and quartz are extremely variable. In fact, the phosphate of lime, sulphate of lime, carbonate of lime and quartz can easily be distinguished from the greensand grains with which they are mixed, by the eye. They do not form any necessary part of the mineral, and may be rejected from the analysis. Leaving these out, and computing again for 100 parts we have the following results :

	A	B	C	D
Silica	42.643	48.639	49.152	51.110
Peroxide of iron.....	23.233	19.802	18.481	18.231
Alumina	7.093	6.842	8.519	6.214
Protoxide of iron.....	4.718	4.236	3.219	4.033
Magnesia	2.366	2.326	2.790	3.134
Potash.....	9.071	9.087	8.730	7.607
Water lost at 212°.....	6.668	4.629	3.527	5.165
Water lost above 212°	4.218	4.439	5.222	4.506
	<hr/> 100.000	<hr/> 100.000	<hr/> 100.000	<hr/> 100.000

	E	F	G
Silica	48.977	50.923	51.532
Peroxide of iron.....	20.466	19.353	18.479
Alumina.....	8.566	7.503	7.322
Protoxide of iron.....	4.135	3.909	3.733
Magnesia.....	2.647	2.918	3.628
Potash	7.262	7.505	7.491
Water lost at 212°.....	7.947	7.889	7.815
Water lost above 212°.....			
	100.000	100.000	100.000

The ratios of the oxygen in the protoxides, peroxides, silicic acid and water are given in the following table :

	A	B	C	D	E	F	G
Protoxides.....	1.	1.	1.	1.	1.	1.	1.
Peroxides	3.	2.6	3.	2.5	3.	3.	2.5
Silicic acid.....	6.4	7.6	8.	8.	8.	8.	8.
Water above 212°.....	1.	1.	1.3	1.	2.	2.	2.
Water below 212°.....	1.6	1.2	1.	1.3			

The specimens from which the above results were obtained, were taken from various places in a belt ninety miles long and nine or ten miles wide, and to the best of our judgment represent the greensand of the whole area. In examining the grains prepared for analysis, those marked A were seen to be more irregular in form, to contain many pale-green soft granules, and if this had been allowed to guide they would not have been analyzed. The results show them to contain less silica, but otherwise to be like the rest. The ratio of the oxygen in the peroxides of both D and G of the Upper Marl Bed is smaller than in any of the others.

The whole examination, however, shows greensand or *glauconite* to be a distinct mineral species, possessing as uniform a composition as can ordinarily be found in any mineral that is not crystalized.

CHEMICAL ANALYSES OF GREENSAND MARLS.

The following analyses show the composition of the different grades of marl as they are dug out of various pits, and as they are

applied to the soil. The greensand or glauconite in them is of nearly uniform composition; but there is mixed with it carbonate, sulphate and phosphate of lime, quartz sand, clay, sulphate and phosphate of iron, shells and other fossils, &c. The differences in the kind and quantity of these substances cause wide differences in the appearances of the marl containing them, as well as in its composition and properties.

The first table of analyses shows the composition of typical specimens of marl from the different beds. The remaining analyses are arranged in the order of the several beds, beginning with the lowest and presenting the samples from each in succession from the north-east towards the southwest.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Phosphoric Acid.....	1.14	1.33	1.02	2.24	2.69	2.56	3.58	3.87	2.58	2.30
Sulphuric Acid.....	0.14	.00	.27	.39	.26	0.22	0.97	0.31	1.89	.00
Silicic Acid and Sand...	38.70	46.03	50.23	50.80	49.40	51.50	53.15	54.75	59.80	57.67
Carbonic Acid.....	6.13	.....	.....	.....	.....	.....	.....	.....	.....	.....
Potash.....	3.65	5.67	6.32	5.18	6.31	4.62	3.75	4.11	4.25	3.53
Lime.....	9.07	2.01	1.40	2.13	2.52	1.26	3.27	5.46	2.97	1.26
Magnesia.....	1.50	3.47	3.45	3.54	3.24	3.95	1.75	2.99	2.00	3.67
Alumina.....	10.20	7.86	7.94	8.77	8.90	6.01	8.79	6.46	6.00	10.10
Oxide of Iron.....	18.63	25.23	20.14	17.63	17.11	21.04	15.94	15.20	11.98	14.16
Water.....	10.00	8.40	9.00	9.66	9.10	7.39	8.98	6.85	8.32	7.25
	99.16	100.00	99.77	100.34	99.53	98.55	100.18	100.00	99.79	99.94

No. 1 is an average of the variety of marl most largely used in eastern Monmouth. It is from the Lower Marl Bed, not particularly rich in phosphoric acid, but remarkable for containing from 10 to 20 per cent. of carbonate of lime in fine powder. In the neighborhood of the marls, where it costs little more than the cartage, a great deal is used which is much poorer than this; but there is no trouble in finding millions of tons of this quality. It is used in larger quanti-

ties than the other varieties and is remarkable for the permanent improvement it makes in the soil.

Nos. 2, 3, 4, 5 and 6 represent the green marls of the Middle Bed.

2. Marl from the Cream Ridge Marl Company, Hornerstown, Monmouth county. The analysis was of an average specimen, collected by E. H. Bogardus. This marl belongs to the Middle Bed.

3. Marl from the Pemberton Marl Company's pits, Pemberton, Burlington county. The sample was an average, prepared by J. C. Gaskill, superintendent. This is in the Middle Marl Bed.

4. Marl from Kirkwood, Camden county, and from the Middle Marl Bed. There is abundant supply of this marl to be had; and it is the source from which it can be easiest sent to all of Atlantic county, and the country along the Camden and Atlantic Railroad.

5. Marl from the Middle Bed, as opened in the pits of the West Jersey Marl and Transportation Company, near Barnsboro, Gloucester county. Several hundred tons of it are sent over the West Jersey Railroad every day, to supply the wants of farmers in all the country which is reached by that road and its branches.

6. An average sample of the green marl of the Middle Bed, as dug at Dickinson's pits, at Woodstown, Salem county. From 10,000 to 15,000 tons are carted annually from these pits to the neighboring farms.

Nos. 7, 8, 9 and 10 are analyses of representative specimens of the Upper Marl Bed.

7. An average of five analyses of Squankum marls from as many different marl banks, near Farmingdale (Squankum), Monmouth county. Each specimen analyzed was an average of the marl dug at the pit.

8. An average sample taken from a heap of 100 tons sent by the Squankum and Freehold Marl Company to New Brunswick. A sample of the green layer, carefully averaged at the pits of this company, by E. H. Bogardus, yielded on analysis 4.58 per cent. of phosphoric acid.

9. An average sample of marl, dug at the pits of the Squankum Marl Company, near Farmingdale. This is a mixture of the *green marl* and the *ash marl* of the Upper Marl Bed, both of which are here dug. The ash layer contains more clay. The mixture makes a good fertilizer. This marl is sent to all points on the line of the New Jersey Southern Railroad.

10. Marl from the pits of the Vincentown Marl Company, near Vincentown, Burlington county. This comes from the green marl layer of the Upper Bed.

CLAY MARLS.

	1	2	3	4	5	6
Phosphoric acid.....	1.15	0.58	0.18	0.24	0.18	1.28
Sulphuric acid.....	1.28	.....	3.42	2.22	0.36	.....
Silicic acid and sand...	34.50	45.40	67.26	65.00	64.70	74.10
Potash.....	1.54	3.79	5.16	2.49	2.52	1.19
Lime.....	2.52	1.51	0.62	0.39	1.40	1.34
Magnesia	2.15	2.20	1.94	0.85	0.90	1.72
Alumina.....	6.00	5.80	4.36	6.76	6.20	6.61
Oxide of iron.....	31.50	24.50	10.27	10.86	12.35	6.49
Water	18.80	15.40	5.70	5.80	10.66	8.25
Organic matter.....	.....	.....	.....	5.35	.....	.....
	<u>99.43</u>	<u>.....</u>	<u>98.91</u>	<u>99.96</u>	<u>99.27</u>	<u>100.98</u>

1. Analysis of a sample from the stratum near Ten Eyck Brothers, at Matawan, Middlesex county: (a)

2. Analysis of a sample from the farm of J. B. Johnson, on the Matchaponix creek, three miles south of Spotswood, Middlesex county.

3. Analysis of a sample from the land of Miller Howard, Shelltown, Burlington county.

4. Analysis of a sample from the land of Benjamin C. Tatum, near Woodbury, Gloucester county.

5. Analysis of a black clay of this formation.

6. Analysis of *marl* from the land of John E. Hopkins, Haddonfield, Camden county.

Nos. 1, 2, 3 and 4 are clay marls, and have been used as fertilizers. They are slightly acid from the sulphate of iron in them, and need care in applying them to the soil. They contain much less phos-

(a) This specimen was carefully washed to separate the grains of greensand from the clay, and was found to contain twenty-seven per cent. of greensand grains. The mass is somewhat like clay in consistency, though when exposed in piles it falls into sandy powder. It is greenish in color, and changes to a rusty red on exposure to the atmosphere.

phoric acid than the marls of the several marl beds. Wherever applied they have been found beneficial. The Messrs. Ten Eyck and many of their neighbors near Matawan, have used them satisfactorily. Enoch Hardy, near Jacksonville, showed a remarkable growth of clover from the application of clay marl. Mr. Craig, near Englishtown, has dug and used it with good results. It has been used by Mr. Waln, at Waln's mills; by Mr. Howard, at Shelltown. In Burlington county, along the Rancocas, it has been used in many places; also in Camden and Gloucester counties, and with profit. When found upon the farm, so that the hauling is short, it is better economy to use it than to purchase the richer but more expensive marls found at a distance. With these marls and lime to alternate, land can be kept in first-rate condition; and they deserve to be much better known than they now are.

No. 5 is a specimen of the dark clay which is very common in the formation.

No. 6 is called a *marl*, and has been used as a fertilizer with good success. Some portions of it contain a good deal of white carbonate of lime from decaying shells. With the exception of the phosphoric acid, this is an average of the laminated sands.

MARLS FROM THE LOWER MARL BED.

Samples from the Navesink Highlands, shore of Sandy Hook bay.

	1	2
Phosphoric acid.....	1.51	1.77
Sulphuric acid.....	2.40	.....
Silicic acid (soluble).....	36.89	} 52.70
Silicic acid (insoluble) (sand).....	18.80	
Potash.....	5.27	4.30
Lime.....	0.65	1.51
Magnesia	0.79	2.10
Alumina.....	6.61	6.20
Oxide of iron.....	21.63	23.27
Water	8.85	7.26
	<hr/> 102.40	<hr/> 99.11

No. 1 is a black marl; No. 2 is a marl rich in phosphoric acid.

The top marl found in this finely exposed bank is more sandy than these specimens whose analyses are here given.

Marl from the bank of Wm. V. Conover, north shore of the Navesink river, at Red Bank, Monmouth county.

Phosphoric acid.....	1.14
Sulphuric acid.....	0.14
Silicic acid and sand.....	38.70
Potash.....	3.65
Lime	9.07
Magnesia.....	1.50
Alumina.....	10.20
Protoxide of iron	18.63
Water	10.00
Carbonic acid.....	6.14
	<hr/>
	99.16

A sample of the best marl of this bed. It contains about fifteen per cent. of carbonate of lime. In this bank also, at the top, there is more quartz sand and less lime in the marl than in the specimen analyzed.

Samples from the marl bank of Rev. Garret C. Schanck, on Hop Brook, near Marlborough.

	1	2
Phosphoric acid.....	2.18	2.08
Sulphuric acid.....	.....	0.76
Silicic acid and sand.....	43.70	56.30
Potash.....	3 82	4.92
Lime	8.85	trace.
Magnesia.....	2.33	1.70
Oxide of iron.....	25.00	{ 17.38
Alumina		
Water.....	9.21	8.05
Carbonic acid.....	5.40	.....
	<hr/>	<hr/>
	100.49	99.39

No. 1 is a carefully selected and averaged sample of the whole bed

as dug, twenty-one feet. No. 2 is a black marl; it has evidently been changed by sulphate of iron, and all carbonate of lime dissolved out.

Blue marls dug at Marlborough, Monmouth county.

	1	2
Phosphoric acid.....	1.14	1.60
Sulphuric acid.....	0.31	.....
Silicic acid and sand.....	38.70	41.50
Potash.....	4.47	.....
Magnesia	1.21	2.37
Oxide of iron and alumina.....	30.67	30.12
Carbonate of lime.....	13.91	11.47
Water	11.22	9.91
	<hr/>	<hr/>
	99.63	

1. A good sample of the blue marl dug at the pits of Richard Laird.

2. This is an analysis of a carefully averaged sample, for a depth of 18 feet, at the pits of O. C. Herbert, and they represent fairly the large amount dug annually at the pits of Uriah Smock, O. C. Herbert and others, near Marlborough. Certain layers, as for example the *shell layer* in these pits and in some of the marl banks of Holmdel and Middletown townships, contain more carbonate of lime. As much as 23 per cent. has been found in some specimens, but the average of the whole blue marl layer is fairly given above.

Marl from the northwest slope of the Mount Pleasant Hills.

Phosphoric acid.....	0.84
Sulphuric acid.....	0.12
Silicic acid and sand.....	52.07
Potash.....	6.46
Lime.....	1.01
Magnesia	1.53
Alumina.....	6.96
Oxide of iron.....	21.55
Water	9.31
	<hr/>
	99.85

This marl was from Morgan's bank, near Mount Pleasant.

It is a fair sample of what are termed hill marls. Surface water has penetrated them to some extent and then draining out, takes the carbonate of lime and changes the protoxide of iron to a peroxide.

Such marls are dug on this northern slope of this range of hills, from Middletown to Marlborough. In many localities the marl is dry, but still retains its original per centage of lime. The marls on the southern slope of these hills are generally of this latter character.

Sand marls from the sand marl layer of the Lower Marl Bed.

	1	2	3
Phosphoric acid.....	0.85	0.94	0.76
Sulphuric acid.....	2.25	4.22	0.35
Sand and silicic acid.....	68.50	68.66	67.40
Carbonate of lime.....	0.26	1.73	0.95 (lime)

1. Sand marl from the pits of Richard Laird, Marlborough.

It has some value on account of its phosphoric acid.

2. Sand marl from Hartshorn's pits, north of Freehold.

3. Marl from the bottom of the bed, as dug in the pits of John B. Buckelew, near the Monmouth Battle Ground.

Marls north of Freehold.

	1	2
Phosphoric acid.....	0.38	1.89
Sulphuric acid.....	0.20	0.18
Silicic acid and sand.....	53.10	53.91
Potash	3.78	.....
Lime.....	.....	2.62
Magnesia.....	0.70	
Alumina.....	6.30	
Protoxide of iron.....	15.39	
Water	8.64	
Carbonate of lime.....	12.10	
	<hr/>	
	100.59	

1. Blue marl from Hartshorn's pits.

2. Marl from the pits of Dr. J. C. Thompson. This is a changed marl, but rich in phosphoric acid.

Marls from Manalapan and Millstone townships, Monmouth county.

	1	2	3	4
Phosphoric acid.....	2.37	2.75	2.38	2.33
Sulphuric acid.....	.....	.....	.....	0.64
Silicic acid and sand.....	47.10	44.70	50.40	54.70
Potash.....	.....	.....	.....	4.15
Lime.....	2.52	2.69	2.52	1.40
Magnesia.....	2.44	.....	1.76	2.00
Oxide of iron.....	32.93	29.40	30.34	20.36
Alumina.....				8.70
Water.....	8.90	.....	8.07	6.41
Carbonic acid.....	.....	.....	1.50	.....
	-----	-----	-----	-----
			96.97	100.69

1 and 2. Marls from the pits of John R. Perrine, Black's Mills, Manalapan, N. J. They were sent to the laboratory by Mr. Perrine.

3 and 4. Marls from Perrineville pits, of Wm. H. Mount.

3 is an average of eleven feet depth of marl.

4. Marl taken from a heap near the pits.

Marls from West Jersey.

	1	2	3
Phosphoric acid.....	1.28	1.34	1.39
Sulphuric acid.....	0.73	.....	.87
Silicic acid (soluble).....	74.60	65.60	20.20
Silicic acid (insoluble sand).....			49.92
Potash.....	1.41	.....	2.46
Lime.....	0.84	4.54	2.36
Magnesia.....	0.14	1.47	0.42
Alumina.....	13.69	13.89	6.10
Protoxide of iron.....			8.32
Water.....	7.13	7.11	7.08
	-----	-----	-----
	99.82		99 12

1. Marl from pits west of and near Carpenter's Landing, Gloucester county. This is not used extensively, although it is well exposed and accessible.

2. Marl from the bank of N. Lippincott, Auburn, Salem county. This marl is used to a large extent. Its phosphoric acid and seven per cent. of carbonate of lime make it valuable.

3. Marl from Marshallville, Salem county. This is a very good fertilizer. It is not acid in its reaction, but contains carbonic acid enough to effervesce with acids.

It will be observed, on comparing the analyses given above, that this bed is more sandy towards the southwest than in Monmouth county.

INDURATED GREEN EARTH.

Analysis of a specimen from Tinton Falls, Monmouth county, and Glendale, Camden county.

	1	2
Phosphoric acid.....	1.20	2.58
Sulphuric acid.....	.....	.....
Silicic acid and sand.....	36.70	44.30
Potash	3.10	.....
Lime.....	1.56	2.85
Magnesia	2.60	2.59
Alumina.....	43.58	33.24
Oxide of iron.....		
Water	10.62	9.88
	<hr/> 99.36	<hr/>

1. This is from the farm of Mr. Polhemus. It has been used to some extent as a fertilizer, and with good effect.

2. From J. P. Craig's farm, Glendale, Camden county. It is dug from under the marl, and is a good fertilizer.

MARLS OF THE MIDDLE MARL BED.

Marls from the eastern part of Monmouth county.

	1	2
Phosphoric acid.....	0.19	0.64
Sulphuric acid.....	0.41	0.38
Silicic acid, (soluble).....	46.93	} 42.50
Silicic acid, (quartz)	4.22	
Potash	7.08	5.71
Lime.....	0.49	0.78
Magnesia	2.02	1.47
Alumina.....	8.23	7.00
Oxide of iron	23.13	33.06
Water	6.67	9.91
	<hr/>	<hr/>
	99.37	101.45

1. Marl dug near Eatontown. This is a pure greensand, but rather poor, containing an uncommonly small amount of phosphoric acid.

2. A red marl from the Holmdel and Keyport turnpike, and from the top of cut in the Big Hill. This is greensand whose iron has been oxidized, or *rusted* by long exposure to atmospheric agents. It has not been used as a fertilizer.

Marls from Blue Ball and vicinity, Monmouth county.

	1	2	3	4	5
Phosphoric acid.....	0.50	1.04	0.75	0.42	0.24
Sulphuric acid.....	0.34	1.44	.....	0.04	0.09
Silicic acid and sand..	47.50	54.11	65.70	45.70	46.10
Potash.....	5.29	6.98	3.78	3.15	2.90
Lime	0.56	0.48	.....	*28.00	*20.50
Magnesia	2.70	3.79	1.80	1.00	0.70
Oxide of iron.....	20.52	} 23.39 {	14.43	10.69	17.38
Alumina.....	8.60		8.40	7.70	7.20
Water	13.57	8.11	4.60	3.11	4.98
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total.....	99.58	99.34	99.46	99.81	100.09

* Carbonate of lime.

1. Marl from the farm of Daniel Jones, southeast of Freehold. This is nearly pure greensand, but it is not active as a fertilizer.

2 and 3. These are good specimens of the green marls which are found at Covert's pits, south of Blue Ball. They are nearly pure greensand.

4 and 5. Grey marls, from the shell layer of the Middle Bed, and from the pits of Henry C. Brinckerhoff, south of Blue Ball. They are valuable for the large amount of *carbonate of lime* which they contain.

Marls from Upper Freehold, Monmouth county.

	1	2	3
Phosphoric acid.....	1.58	1.33	1.34
Sulphuric acid.....	2.27	traces.	0.00
Silicic acid and sand.....	49.77	46.03	46.82
Potash.....	5.78	5.67	5.59
Lime.....	2.56	2.01	2.02
Magnesia.....	2.79	3.47	3.10
Alumina.....	24.49	7.86	6.48
Oxide of iron.....		25.23	23.93
Water.....	10.49	8.40	9.70
Total.....	99.73	100.00	98.98

1. Green marl from near the top of the layer as dug at the pits on the estate of Samuel Horner.

2. An average sample from the Cream Ridge Marl Company's pits, collected by E. H. Bogardus in 1869.

3. Marl from the same locality as 2. An average collected in 1870.

Burlington county Marls belonging to the Middle Marl Bed.

	1	2	3	4
Phosphoric acid.....	1.02	1.28	1.79	2.16
Sulphuric acid.....	.27	1.37	.....	4.00
Silicic acid and sand.....	50.23	51.92	47.00	49.20
Potash.....	6.32	5.36	.....	.....
Lime.....	1.40	1.68	1.90	2.80
Magnesia.....	3.45	3.38	3.05	3.66
Alumina.....	7.94	5.40	30.11	26.64
Oxide of iron.....	20.14	19.82		
Water.....	9.00	8.70	8.44	
	99.77	98.91		

1. Marl from the Pemberton Marl Company, from J. C. Gaskill, Superintendent; sent as an average sample of the whole bank. This marl is well known for its extensive use.

2. Marl from the Pemberton Marl Company, collected by E. H. Bogardus in 1870.

3. Marl from Lawrence W. Jones' bank, along Sharp's Run near Medford. This is an averaged sample in a digging of 9 feet. It is extensively used and much liked.

4. Marl from Inskip's Bridge. This is an acid marl, but of good quality and much used.

Marls from Camden and Gloucester counties, from the Middle Marl Bed.

	1	2	3	4	5	6	7
Phosphoric acid....	2.24	3.66	2.69	1.60	2.50	3.60	3.48
Sulphuric acid.....	0.39	0.62	0.26	.....	.....	.98	.....
Silicic acid and sand	50.80	49.94	49.40	51.10	47.30	46.66	49.80
Potash.....	5.18	6.31	6.31	6.46	.....	6.82	.....
Lime.....	2.13	2.37	2.52	2.13	2.97	2.86	1.68
Magnesia.....	3.59	2.71	3.24	3.85	2.69	3.09	3.50
Alumina.....	8.77	24.54	8.90	9.15	29.91	26.61	28.22
Oxide of iron.....	18.83						
Water.....	8.46	9.43	9.10	6.75	8.96	8.57	.....
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	101.39	99.58	99.53	99.24		99.19	

1. Marl from Minor Rodgers' pits, Kirkwood, Camden county. This is an average for fourteen feet. This marl is extensively distributed along the line of the Camden and Atlantic Railroad, and is a good one.

2. An average sample from David E. Marshall's pits, Blackwoodtown, Camden county. It is an excellent fertilizer, and is largely used.

3. A carefully averaged sample of marl, from the West Jersey Marl Company's pits, Barnsboro, Gloucester county. It is from the green layer. It is extensively used and well known.

4. An average from the West Jersey Marl Company, collected by E. H. Bogardus, 1870.

5. Marl from Heritage's banks, Hurffville, Gloucester county. This is an average of the whole green marl layer. It is an excellent marl.

6 and 7. Marls from N. T. Stratton's bank, two miles east of Mullica Hill, Gloucester county.

6. A good sample of the green marl.

7. Is a carefully averaged sample of the whole bed. They are both good marls, and much used.

Marls along Oldman's creek, and marls of Salem county, belonging to the Middle Bed.

	1	2	3
Phosphoric acid.....	2.34	2.56	2.05
Sulphuric acid.....	0.21	0.22	.....
Silicic acid and sand.....	50.00	51.50	48.15
Potash	6.18	4.62	6.07
Lime	1.57	1.26	0.38
Magnesia.....	0.60	3.95	1.20
Oxides of iron.....	24.32	21.04	30.38
Alumina	6.15	6.01	4.56
Water	6.88	7.39	5.97
	<hr/> 98.25	<hr/> 98.55	<hr/> 98.76

1. Marl from Jesse Lippincott's pits, near Oldman's creek, Gloucester county. This is an average of the green marl of this neighborhood.

2. Marl from Dickinson's pits, west of Woodstown, Salem county. This is an average of the whole of the green marl layer which in these pits is fifteen feet thick. It has a high reputation and extensive use.

3. This is an average of four analyses of as many samples, from different layers in the pits of Messrs. Pettit, Mannington township, Salem county. In this marl the carbonate of lime seems to have been replaced by oxide of iron.

Limestone and Limesand from the Upper layer or member of the Middle Marl Bed.

	1	2	3
Phosphoric acid.....	0.04	0.20	.....
Sulphuric acid.....	0.06	0.33	.....
Silicic acid.....	23 31	8.11	7.05
Magnesia.....	1.81	1 40	1.15
Alumina ...	0.91	0.86	} 4.90
Oxides of iron.....	3.07	3.56	
Carbonate of lime.....	69.61	84.73	80.40
Water	0 24	0.45	.....
	<hr/> 99.05	<hr/> 99.54	<hr/>

1. Selected as a fair sample of the yellow limestone in Mannington township, Salem county. This limestone makes a lime almost free from magnesia, and in that respect is quite different from that made from most of our blue limestones.

2. Limesand from Swede's bridge, Mannington township. This is a sample of the loose variety of the limesand; it is grey in color, and contains many greensand grains.

3. Limesand from the vicinity of New Egypt. This is a good calcareous marl, though not much used.

"Chocolate Marls" underlying the green marl of the Middle Marl Bed.

	1	2	3
Phosphoric acid	1.60	1.47	1.28
Sulphuric acid .....	.....	1.30	0.61
Silicic acid and sand	51.50	48.00	47.90
Potash	5.59	4.70	6.20
Lime	1.01	1.68	1.34
Magnesia	2.74	3.77	3.65
Alumina and oxides of iron ..	29.26	30.94	29.94
Water	9.13	9.41	9.11
	<hr/> 100.83	<hr/> 101.47	<hr/> 100.05

1. Chocolate marl from Belly Bridge, near Lumberton, Burlington county.

This is a specimen of the *chocolate colored earth* found everywhere in Burlington county, immediately under the green marl of the Middle Bed. It is called *marl*, and is used as such with good results.

2. From the pits of the West Jersey Marl Company, near Barnsboro, Gloucester county.

It is an acid marl.

3. "Chocolate marl" from pits near Major's Run, southwest of Sharptown, Salem county.

This marl is acid in its reaction, but when carefully used it is a valuable fertilizer, and is liked by farmers.

UPPER MARL BED.

Marls of Deal, Poplar and Shark River, Monmouth county.

	1	2	3	4	5
Phosphoric acid.....	1.70	4.16	1.28	6.87	3.73
Sulphuric acid.....	.....	0.04	1.47	3.12	2.44
Silicic acid and sand.....	51.20	55.50	55.50	44.68	49.68
Potash.....	2.96	3.50	3.99	3.97	4.98
Lime.....	1.51	4.20	2.80	4.97	4.14
Magnesia.....	1.50	1.80	1.68	2.97	0.47
Oxides of iron.....	11.90	19.41	18.20	18.97	} 28.71
Alumina	23.67	3.70	6.70	6.04	
Water.....	5.53	8.39	9.25	8.63	5.54
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	99.97	100.70	100.87	99.32	99.69

1. An average specimen from the green marl layer at the pits of J. Gardner, Deal.

2. Blue marls from the upper layer of the bed. Jacob White, Deal.

3. A *changed* marl from the same pits as No. 2. These samples were taken from the same level and but a few feet from each other. They illustrate the change in composition effected by air and moisture.

4. Marl from Howland's pits, Poplar. This sample was taken from a heap and was better than the average. It was selected for its large percentage of phosphate of lime, the greatest ever found in our greensand marls. It was from the green marl layer.

5. A green marl from Hugh Hurley's pits, Shark River. Another specimen from the same pits had 2.58 per cent. of phosphoric acid. This marl is extensively used.

Squankum Marls, Monmouth county.

	1	2	3	4	5	6
Phosphoric acid.....	3 23	4.54	3.97	3.59	3.87	4.67
Sulphuric acid .....	.....	0.43	.....	1.41	0 31	0.51
Silicic acid and sand..	50.70	51.16	56.50	51.40	54.75	52.70
Potash.....	3.02	4.27	3 97	.....	4.11	3.81
Lime	2.63	3.48	3.08	3.08	5.46	5.52
Magnesia	1.20	2.04	2.00	.....	2.99	2.70
Oxides of iron.....	22 77	17.67	11.68	} 28.32	15.20	15 92
Alumina.....	10.50	6 10	10.30		6.46	8.66
Water	5.51	9.13	7.92	7 19	6.85	6 40
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	99.56	98.82	99 42	.....	.....	.....

These analyses are all of the green marls—the lowest layer of this bed.

1, 2 and 3. Marl from C. G. Boud's pits. The *green marl* of the Squankum Marl Company is like these.

4. Marl from Jas. Butcher's pits.

5 and 6. From the pits of the Squankum and Freehold Marl Company. The first is an average of 100 tons sent to New Brunswick; the last is an average sample, collected in 1870 by E. H. Bogardus.

	1	2	3	4
Phosphoric acid	1.20	0.88	2.58	2.18
Sulphuric acid	2 16	.....	.....	0.75
Silicic acid and sand	73.10	73.70	61.60	61.00
Potash .....	.....	2.39	2 58	2.54
Lime	1.62	0 61	0.87	1.85
Magnesia .....	.....	1.00	2 20	1.62
Alumina	} 12.60	5.20	7.70	} 19.67
Oxides of iron		5.89	14.24	
Water.....	8.26	9.31	8.53	11.20
	<hr/>	<hr/>	<hr/>	<hr/>
		98.98	100.30	100.81

1. Ash marl from the pits of the Squankum Marl Company.

2. Ash marl from the pits of Mrs. J. P. Allaire, on the southwest bank of the Manarquan river, near Lower Squankum.

These ash marls constitute the middle layer of this bed ; do not contain any greensand, but are good fertilizers.

3. Blue marl from J. S. Forman's pits. This is the top layer of the bed.

4. *White marl* or fuller's earth from the Squankum Marl Company's pits, and at the bottom, under the green marl.

Marls from New Egypt and vicinity.

	1	2
Phosphoric acid.....	2.53	2.05
Sulphuric acid.....	2.26	.....
Silicic acid and sand.....	63.15	55.10
Potash.....	5.04	.....
Lime.....	2.63	2.29
Magnesia.....	1.00	2.66
Alumina.....	4.15	} 22.38
Oxides of iron.....	9.97	
Water.....	9.27	7.76
	<hr/> 100.00	

1. Marl from John Irons, southeast of New Egypt. This is from the green layer.

2. Marl from Samuel E. Emley's pits, Poke Hill, Burlington county ; an average for 11 feet in depth. It is extensively used.

Marls from Burlington and Camden counties.

	1	2	3	4
Phosphoric acid.....	1.68	3.52	2.46	2.64
Sulphuric acid.....	0.96	.....	0.17	0.44
Silicic acid and sand.....	55.93	56.40	57.35	56.20
Potash.....	5.80	.....	4.47	5.37
Lime.....	1.64	3.25	3.36	1.98
Magnesia.....	1.01	1.72	2.99	1.61
Alumina	} 24.41	21.98	{ 5.86	6 00
Oxides of iron.....				
Water.....	8.84	8.60	8.20	9.28
	<hr/> 100.27		<hr/> 99.89	<hr/> 99.81

1. A green marl from Joshua Forsyth's pits, near Pemberton; an average sample.
2. A carefully averaged sample of the green marl from Butterworth's pits, Stop the Jade creek, near Vincenttown. This is a superior marl.
3. An average sample of green marl from the Vincenttown Marl Company's pits, near Vincenttown.
4. A green marl from Hamilton Adams' pits, Clementon, Camden county.

GENERAL STATEMENTS REGARDING THE USE OF MARL.

The marl has been of incalculable value to the country in which it is found. It has raised it from the lowest stage of agricultural exhaustion to a high state of improvement. Found in places where no capital and but little labor were needed to get it, the poorest have been able to avail themselves of its benefits. Lands which, in the old style of cultivation, had to lie fallow, by the use of marl produce heavy crops of clover, and grow rich while resting. Thousands of acres of land, which had been worn out and left in common, are now, by the use of this fertilizer, yielding crops of the finest quality. Instances are pointed out everywhere in the marl district of farms which, in former times would not support a family, but are now making their owners rich from their productiveness. Bare sands, by the application of marl, are made to grow clover, and then crops of corn, potatoes and wheat. What are supposed to be pine barrens, by the use of marl are made into fruitful land. The price of land in this region was considerably below that in the northern part of the State forty years ago; now that the lands are improved, their prices are higher than those in the northern part of the State, though even there they are higher than anywhere else in the United States. In 1830 Thomas Gordon said of these lands:

"It would be difficult to calculate the advantages which the State has gained, and will yet derive from the use of marl. It has already saved some districts from depopulation, and increased the inhabitants of others, and may, one day, contribute to convert the sandy and pine deserts into regions of agricultural wealth."—*Gordon's History and Gazetteer of New Jersey, Part 2, p. 5.*

The reputation of New Jersey soils fifty-eight years ago is

strongly stated in Morse's American Universal Geography, edition of 1819:

"Soil and Agriculture.—The mountainous parts of the State have generally a strong soil, and form a fine grazing country. The farmers there raise great numbers of cattle for the markets of New York and Philadelphia. They also raise wheat, rye, maize, buckwheat, potatoes, oats and barley, enough for their own consumption. They keep large dairies, and make great quantities of butter and cheese. In the counties that are uneven and hilly the soil is likewise generally rich, and very productive of the various kinds of grain, particularly wheat and maize. A narrow tract of country on the Delaware, in Burlington and Gloucester counties, is rich and fertile, as are various similar tracts in the southern half of the State, on the small rivers and creeks. In Salem, Cumberland and Cape May, there are also very extensive tracts of salt meadow on the river and bay. In Gloucester and Burlington similar tracts have been recovered by sluices and moulds from the inroads of the sea, and are now rendered rich, fresh meadow. With these exceptions, the greater part, at least four-fifths of the six southern counties, or two-fifths of the whole State, are barren. They produce little else but shrub-oaks and yellow pines. The inhabitants raise a little maize, rye and potatoes, but subsist chiefly by feeding cattle on the salt meadows, and by fishing on the shores and in the creeks and rivers."

The six southern counties alluded to are: Monmouth (which then included Ocean), Burlington, Gloucester (which then included Camden and Atlantic), Salem, Cumberland and Cape May. In contrast with the above, the census report of 1870 shows that the highest price of land and the largest amount of agricultural products is from the six southern counties, and from those where marl is found.

THE AGRICULTURAL USES OF GREENSAND MARL.

In the winter of 1876–7, the following series of questions was sent out to farmers in various parts of the State, with the request that they would return answers to them, giving their own practice and experience with marl. The inquiries were addressed to so many, in order to get replies from enough to represent all the kinds of marls. And all the answers received are set down. The answers are num-

bered to correspond with the questions, 1 representing the answer to question 1, &c.

Questions.

1. How long and how largely have you used marl?
2. Where, or from whose marl pits have you got your supply?
3. Please state what amount you apply per acre, and how and upon what crops you find it most beneficial or convenient to apply it?
4. Have you found it any more beneficial on some soils than on others; or in wet or dry seasons?
5. What benefits have you found from its use, and what have you observed others to find?
6. Have you found it necessary or useful to compost it, or to mix or alternate its use with other manures?
7. How much does it cost you for purchase and hauling, and how, in your judgment, does its value compare with that of barn yard manure?
8. Please add any remarks or statements you may think of interest or importance, to make this subject understood and appreciated?

Answers.

WM. V. CONOVER, Red Bank, Monmouth county.

1. I have used marl for the last forty years, and have used one hundred loads per acre, but find it better to use a smaller quantity at a time and oftener.
2. I cart it from my own pits.
3. From thirty to one hundred loads per acre, broadcast, for grass, corn or potatoes, and find it very beneficial for all crops, and it improves land more than any other fertilizer, as it will last longer in the ground and will not dissolve or leach out without it comes in contact with vegetation.
4. We find it beneficial to all soils, and it will hold more moisture in dry seasons than manure or any other fertilizer.
5. We have improved land that was so poor you could not raise anything on it, and now we can mow it and cut two tons of hay per acre, all by the use of marl. It will prevent sandy soil from burning

up the crops, and clay soil from baking, and insure crops on all kinds of land.

6. I find it makes a good compost with manure for potatoes, as it makes the potato grow smooth and of a bright color, which makes them bring a better price. In mixing compost, we cart about fifteen loads of manure and fifteen loads of marl and about thirty bushels of slacked lime per acre for potatoes, in drills or rows (especially for dry weather). It will insure a crop and beat all manures.

7. It costs me about forty cents a ton to dig, cart and spread on my land. I have marl in almost every field of my farm. In my judgment it will improve a crop more in a dry season than barn-yard manure, and will last much longer; and it is much cheaper, if you have to buy fertilizers.

8. Marl, as a fertilizer, has been in use about sixty years, and it was little thought of before that time. My father bought the farm I now live on about sixty-five years ago. At that time marl was not much in use. He carted a few loads to try it, and said he could see it in the grass crops for years after, where he had put it on—which made him think it was of great value. He commenced to improve the land by carting 2,000 to 3,000 loads a year, his land, excepting fifteen out of one hundred and fifty acres, being very poor so that he could not raise corn or grass at that time. Now we can mow every acre, and all through the use of marl. The land in my neighborhood is a sandy loam. By the use of marl it has become one of the best agricultural districts.

JOSEPH I. VAN MATER, Holmdel, Monmouth county.

1. Twenty-five years. My grandfather discovered it in 1790. We have used about 3,000 loads a year.

2. At our own pits.

3. From one hundred and thirty to one hundred and fifty loads per acre. On all crops; on the sod; on raw ground; or direct on the potato, as we have it in abundance. We make it a part of the soil.

4. Best on clay soil and in wet seasons. Have known it to hurt crops when used in too great abundance in dry seasons.

5. Great benefits and the same with others.

6. It is very good to compost it, or to mix, or alternate its use with other manures.

7. About fifteen cents a load when found on our own farm. Difficult to compare them. Marl is lasting in its effects. Has been known to last for thirty years. Manure soon loses its effects.

MICHAEL TAYLOR, Holmdel, Monmouth county, New Jersey.

I have used marl since 1848. I purchased a farm of one hundred and twenty acres on Rumsum Neck, in Shrewsbury township, in that year, and immediately commenced using marl upon it. The marl I obtained from Burge's pits on the Middletown, and north side of Shrewsbury river, near the Highlands; also from McClane's pits, in Middletown township, opposite Red Bank. We denominated it the greensand marl. The marl was pitted, boated across the river, and carted to the farm at an expense of one and a half dollars per load of twenty bushels. We used large quantities of said marl for potatoes, a compost of the marl and barnyard manure (equally composed), made the best fertilizer for potatoes I ever used. The quantity used of such compost was from ten to twelve loads per acre. I have used the above marl as a top-dressing on grass, putting on about ten loads to the acre. This farm was composed of four kinds of soils, to wit: heavy clay, red shale, loam and sand. On the sand and red shale loam I do not think the marl was of such benefit as on the heavy clay or the loam, either used as a top-dressing or as a manure to the crops. On heavy clay I have had a top-dressing of marl alone to double the crop of grass; the white clover would immediately come in, and the successive crops following the grass, upon breaking up the sod, would show great improvement. I think the farm, to this time, shows good results from the marl then used. I also used considerable marl from Poplar, and some from the vicinity of Eatontown, the results of which, on the same farm, were about the same as above mentioned.

In 1858 I sold my farm in Shrewsbury and removed to one I purchased on Cream Ridge, in the township of Upper Freehold. During my first two years residence there I used marl (the blue shell marl), from Nimrod Woodward's pits, carting the same about two miles, and at a cost of fifty cents per load at the pit. I put on about ten loads to the acre on grass; found it did well, and thought it worth two dollars a load to me. In 1860 I discovered marl on my own farm there, which I then used in the same proportion, and which I considered as good as the other. As an experiment I used on this

farm some marl from the pits of the Cream Ridge Company, and with satisfactory results. I sold in 1869 this farm, and could still see the good effects of the marl I first applied thereon. This farm was high, dry and stiff clay loam. I am now living in Holmdel township, near the village of Holmdel; I have, as well as nearly all the farmers in this township, an abundance of blue shell marl immediately on the place. The land in this vicinity is a heavy loam, and has been brought up by the use of marl, together with the barn-yard manure made on the place, from quite ordinary condition, and in some instances by the present occupants, to as high a condition of fertility as any land in this State. We put on from one hundred to one hundred and fifty dump-wagon loads, containing from twelve to fifteen bushels each to the acre, at a cost of twelve to fifteen cents a load for digging and carting, and at a further cost of one and a quarter dollars per hundred loads for spreading the marl. The marl we have here and in this section, seems beneficial to all kinds of soil or crops, especially to the potato crops. An application of this marl has been known by me to show extraordinary results for twenty-five years. My experience as to the benefit of marl in wet or dry seasons, leads me to the conclusion that the blue shell marl may be applied beneficially in either a wet or dry season, but I am satisfied that the greensand marl is the most beneficial, if applied during a wet season, so far as the immediate results would be concerned. But at the same time there is no doubt of eventual benefit in the following crops, if of no benefit to the first.

SAMUEL W. JONES, Atlantic township, Monmouth county..

1 and 2. I have been using marl more or less every year for over half a century, and I have used yearly from one hundred to four thousand loads per acre. When at home with my father, near Medford, Burlington county, we used from one hundred to two hundred tons a year of the Sharps run marl. Since 1830 I have been using the blue-shell marl, dug on my own farm along Hop brook creek, Atlantic township, Monmouth county. I have also used some Squankum marl on a farm now owned by Daniel Jones, near Freehold. This cost two dollars a ton. A dressing of lime once in four or five years helped this very much.

3. In Burlington county we used of the Sharps run marl fifteen to twenty tons per acre. The Squankum marl was used at about the

same rate on the farm near Freehold. It is most convenient to apply it on the sod, for the next year's corn crop, at the rate of one hundred to one hundred and twenty-five loads (cart or dump wagon loads of about half a ton,) per acre; then, in the winter, at same rate, on the corn ground, for potatoes, following the corn. This mode of using applies to the blue-shell marl.

4. It is more beneficial on heavy or loamy than on dry or sandy soils, although it will benefit both very much. It is also more beneficial on low or wet than on dry or thirsty lands, and it is more beneficial in wet seasons.

5. We think it so beneficial to some crops, say for potatoes, and also on fallow ground which is to be seeded with grass, that we would hardly think it advisable to plant or sow on fair land even, without a dressing of marl or compost, unless instead of these some other fertilizer was used.

6. In my judgment, it is much better to compost or alternate it with other manures, as I think that both are benefited thereby. And this compost, or alternation, is better for the soil and almost all crops than marl or manures applied alone. There is one exception to this, in the case of potatoes in extreme droughts, when marl alone does equally well as compost. Composted with manure, and applied on fallow, in the fall, either with wheat or rye, and plowed in with the grain, or *skim*-plowed, and then harrowed in, previous to drilling in the grain (keeping both marl and manure near the surface), I consider the best way of using marl.

7. I have always had marl on my premises, and have had no expenses, except hauling, which I consider to be about ten cents a load.

8. The blue-shell marl found along the Hop brook needs no lime. Wherever it has been used in sufficient quantity, lime shows no effect, as I have found from repeated trials. On new ground lime does good, appearing to decompose the roots and other woody fibre in the soil.

My first experience with marl as a fertilizer was with that on Sharp's run, near Medford, Burlington county. About the year 1824 my father came into possession of a farm of about fifty acres on Sharp's run, now owned by Lawrence W. Jones. A considerable portion of this was in meadow, underlaid by marl from eighteen inches to three feet beneath the surface. This meadow land had

never, to my knowledge, been plowed. A large portion of it, particularly the higher ground, was covered with Indian grass and moss, and was not worth mowing. Some of the lower part of this meadow produced good grass, white clover and herd grass. We commenced using marl, spreading it in the fall and winter, at the rate of fifteen to twenty tons to the acre, on this moss and Indian grass, and instead of them we had a heavy swath of white and red clover, and that without any seeding. This ground has ever since continued to produce good crops, excepting in very dry seasons, although it has had only light dressings of marl at intervals of ten to fifteen years. We also used a considerable quantity on some upland, applied in the fall as a top dressing on young grass, after seeding down in the spring previous. We always found that the Sharp's run marl gave better results when applied as a top dressing on grass or grain, excepting in extremely dry seasons. Then, in the case of grain, it might be better to incorporate it in the soil, keeping it, however, as near the surface as possible. We also used this marl on potatoes, both in hills and in rows, and with good results.

My next experience was with the blue-shell marl along Hop brook, on the farm where I now reside. I have tried it in various ways and on different crops—on potatoes in hills and in rows, and broadcast, working it into the soil, with good results. I prefer to keep it as near the surface as possible, and consider one hundred cart loads a very good dressing. Although we sometimes use more, still I think it better to use a less amount at a time and more frequently, as it then gets more thoroughly incorporated in the soil.

REV. G. C. SCHANCK, near Marlborough, Monmouth county.

1. I have used marl on my own land now for twenty-four years, and, the larger part of the years, have applied about fifteen hundred tons per year.

2. My land is underlaid with the marl strata, and there is convenient access to it on different parts of the farm, and in any quantity.

3. I have generally applied about fifty tons per acre. After applying two coats I lessened the quantity to twenty-five tons. It is generally applied to land for a potato crop, but will benefit all crops. It seems to promote especially the growth of white clover.

4. Marl applied to any soil will benefit it, and the tendency of the

use of the Lower Bed, or Big Brook marl, is from its lasting character to make a permanent change in the soil. A wet season is more favorable to its use than a dry one.

5. Its use, as far as I have heard, is always beneficial.

6. It is generally applied in Monmouth county separately, but it does well to compost it with manure and apply to the potato crop in the hill. Marl lays the foundation for a good soil, and the use of manure is very beneficial.

7. All the cost to me of marl is the clearing off about three feet of top-soil, and the cartage, say from twenty to forty cents per ton. Where we have it on our farms I consider it more valuable than any other manure.

8. It is a well known fact that the use of marl in Monmouth county for the last sixty years has changed the appearance of nearly the whole county.

The first marl carted out to apply as a manure to land, was about the year 1798, and by Cyrenius Van Mater, then living at Taylorsville, about one and a half miles south of Holmdel. He had learned the nature of it in England. There was a little carted out about 1773 from a ditch on the present farm of Mr. Obadiah Herbert, of Marlborough, the favorable effect of which was seen for many years on the spot where it was put. We have had one instance where, for forty years, and another for forty-five years, in which the lasting benefit of marl has been seen. I remember well, some sixty years ago, and when marl began to claim the attention of farmers, and become a subject of conversation on visiting each other, of hearing them tell about the marvelous effects that marl had on the part of their growing crops where they tried it.

J. W. HERBERT, Marlborough, Monmouth county.

I have used nearly all kinds of marl for several years, but my experience has been principally with the bank or red marl, and blue-shell or lime marls. My homestead farm is underlaid with the red marl which I have used extensively and have found it a very profitable fertilizer, where it has to be hauled but a short distance. After one or two coats of this marl, it fails to show any very decided benefit. Then I find the shell marl pays much better, although we have to haul it some two miles, from the pits of O. G. Herbert, Marlborough; that marl contains some seventeen or eighteen per cent. of lime and

a small percentage of gypsum. On a farm I had in Manalapan township, we used considerable Squankum marl which is a very valuable fertilizer, but not as lasting as the shell marl. While Squankum marl is more valuable on cold, heavy soils, I prefer shell marl on red or irony soils or warm, loamy soils; but no marl does as much good on sandy soil as on clay or loamy soil, and that is true in regard to barnyard manure. On another farm I have, which is underlaid with shell marl, I find that marl with barnyard manure is sufficient to bring the land up to a high state of fertility, and no other fertilizer is required or used. I believe it is generally conceded that blue marl is the most valuable kind to make a permanent improvement of the soil. A smaller quantity of Squankum marl will do more good for one crop, but it is not so lasting, nor is it capable of bringing the soil up to as high a state of fertility. Dr. Gordon of our township, some years ago used one hundred and twenty-five bushels of shell marl to the acre on timothy sod and an equal quantity of unleached ashes on an adjoining acre, a decided difference in favor of the marl was very apparent; but on sandy soils I would prefer ashes, and especially for corn. In regard to the best method of using marl, that, perhaps, very few can answer. Our farmers evidently care more about the certainty of its application than the manner in which it is used, but if they had a longer distance to cart it, and cost them more, it would be used with more economy. I have found composting for early potatoes and wheat to answer a good purpose for early potatoes. Marl and night soil make an excellent compost, perhaps no better can be made with as little expense. We obtain the night soil from New York. The quantity of marl applied per acre by different farmers, differs more than any other fertilizer. Farmers who have it on their farms easy of access, undoubtedly apply much more to the acre than economy or good husbandry would dictate. It would pay better to make more frequent applications with a much less quantity at a time. Some farmers, perhaps, use two thousand bushels per acre, others one hundred to two hundred bushels, and very little difference in the immediate result. Of course the larger quantity improves the soil most and lasts longer. How marl compares with barnyard manure, I would say it is much cheaper, is better adapted to potatoes and grass, and lasts much longer. Our potato crop would not amount to much without marl, and without that crop our lands would not be worth but little over one-half what they are with it. So you see I

have a very high estimation of the value of marl; the fact is, our county has been doubled at least in value by its use.

URIAH SMOCK, Marlborough, Monmouth county.

1. In 1848 I purchased the farm where I now live, my father having previously lived here many years before, and carted a great deal of marl upon it. I carted the first five years three thousand loads, or about fifty thousand bushels a year, also adding about four hundred loads of barn-yard manure broadcast. Found they worked well together.

3. Since that time I have covered all my raw ground through the winter for potatoes. About forty loads to the acre. Could see a great improvement every time I marled it over. The last few years I have marled on my sod ground for corn, and find it a better plan. The marl wants manure to make it act quick.

O. C. HERBERT, Marlborough.

1. I have used *blue-shell* marl for over twenty years, extensively.

2. From my own pits.

3. I apply from ten to eighty loads per acre. Ten loads on mowing or grass land during the winter or early spring. Sometimes we apply more, all owing to circumstances. I find the blue-shell marl beneficial for any crop, especially corn, wheat, rye, oats, grass, potatoes, and fruit; not for strawberries, as it brings in the white clover, which chokes or smothers the strawberry.

4. My experience is, that marl gives the best satisfaction on tight or heavy (clay) soil. And we always see the greatest benefit during a wet season.

5. On the potato crop it has been very beneficial. Last fall, year ago, I sowed nine bushels of Seneca wheat, using marl alone on the ground, my yield was one hundred and seventy-one bushels.

6. We use it any way, with good results.

7. I have marl on my farm. The cost of hauling is about twenty-five cents a load. It is more lasting than barn-yard manure.

T. V. DU BOIS, west of Marlborough.

1 and 2. I have used marl from my own pits for more than thirty years. I use from one thousand to one thousand and two hundred loads per year.

3. I generally apply four or five hundred bushels to the acre. The most benefit is derived when we apply it on high, tillable land, mostly on stubble, when it has two winters' frosts to dissolve and mix it with the soil.

4. The wetter the season, the more good will be derived from it.

6. A very good way to use it is by composting long manure in the spring, chopping and mixing well together in August, then use it for wheat, spreading it on the surface and drilling the wheat in. Marl will last longer and show more than manure. In a few years manure fails, but marl will keep getting better when it gets more mixed with the soil.

DR. J. C. THOMPSON, Freehold, Monmouth county.

1. I commenced using marl in 1837, and have used it quite freely every year since, from three hundred to five hundred loads yearly. For three years, from 1849 to 1852, I carted over one thousand loads each year.

2. I have marl on my farm which I have always used with good success. When I commenced farming I carted several loads from Squankum, and tried the two, side by side, on the grass. The difference was in favor of my marl *on my land*, which is not, however, the case on heavy clay land.

3. When I commenced carting I applied from fifteen to twenty-five loads per acre, but now I find that twelve or fifteen brings as good results as a greater quantity. The custom in this vicinity has almost invariably been to apply it in winter, on land to be cropped with potatoes the coming season, generally following the corn crop, that time being the most convenient to cart and spread on the ground, thus saving labor.

4. I have not noticed any difference as to variety of soil in its application, and but little, if any, in wet or dry seasons, provided it has been applied to the ground some time previous to planting. If any difference in soil it is in favor of heavy or clay soil.

5. By the use of marl a large portion of our land has been brought from a state of barrenness to a state of fertility, not surpassed, perhaps, by any county in the State.

6. There has been but little composting done in this section for a number of years. The difference in the result of the crop by composting, or applying the composted articles separately, is so small

that it does not pay for the extra labor. We generally apply what manures we make on the farm to the marled ground for potatoes, with good results.

7. Having marl on my farm the purchase of it only costs me the digging, which has been from ten to fifteen cents per load, except in war times, when it was double that amount. The hauling costs from twenty to twenty-five cents per load, according as we spread it more or less remote from the pits. Where land has not had quite a liberal dressing of marl previously, it compares favorably with barn-yard manures.

8. When I commenced farming in 1836 there had been no marl dug on the farm, neither was it known that there was any in the immediate vicinity. In the winter of 1837 I dug and carted several loads, and spread on grass. The first application made a wonderful change in the increase of the crop. On what was then considered fair land, fully one-half, and on what was considered quite poor the change was even greater, especially on the grass crop, which, I believe, is the proper crop to apply marl, by increasing which we improve the fertility of the soil. The second application did not show so large an increase in crops, and each succeeding application has been attended with the same result. Considerable portions of our land have been so heavily marled that we can now see but little benefit from its application, yet we believe it is necessary to keep up its fertility.

JOHN VAN DOREN, Manalapan, Monmouth county.

1. Have used marl about twenty-five years, and from one hundred to five hundred loads per annum.

2. For several years I dug on my own farm, but subsequently found it more desirable to get it from Mr. John R. Perrine's pits, and more recently from Mr. D. A. Vanderveer's pits, late Mr. John E. Hunt's. These marls I judge to be somewhat alike, and are the most convenient to my location.

3. In former years have used it chiefly broadcast on old corn ground, for potatoes, from ten to twenty loads per acre, as we could find time to cart it. We get more immediate returns we think in the potato crop, but as it gets thoroughly incorporated with the soil is valuable for any succeeding crops, (excepting, perhaps, less so in the oat crop.) I now use the marl mostly on the grounds in small

fruits, strawberries, raspberries and blackberries, (on strawberries broadcast before setting the plants); also, on my grapery, and pear and apple orchards. The grounds for these are kept raw so long that they need help. Have thus far found no fertilizer, *as a whole*, so desirable. We use bone and barn-yard manure, yet marl is our main dependence for these fruits.

4. The effect of the marl I have found most marked on the poorest clay soils, and also on the lighter sandy soils, but valuable on all my grounds, except where there is an abundance in the surface soil already, which is the case in portions of my fields. The marl, as a fertilizer, is probably less influenced by dry or wet seasons than barn-yard and some other fertilizers.

5. I find it beneficial not only for potatoes and fruits, as referred to in 3 and 4, but valuable on the sod for corn and for the fall crops, rye, wheat and grass crops, in a word for the *general* improvement of the soil, so that the first and great consideration is to *get it on the ground*.

6. We formerly composted it a good deal with barn-yard manure during the winter, for potatoes in the hill; always thought it did well, but on account of the labor, expense and recent failure of the potato crop, have not composted much of late.

7. The cost of the marl and carting I estimate at eighty cents per load, spread upon the ground. Of barn-yard manure we make what we can; occasionally can pick up a few loads at two dollars per load. The comparative value of each depends very much upon circumstances and the particular crop we wish to produce. The barn-yard manure we can have but in a limited degree, but the marl according to our industry and perseverance.

8. In my soil there is a great deal of iron(?); can pick stone in passing over any of the fields highly impregnated with iron; found so much of it in my marl pits that it was one inducement to get it elsewhere; find it also in my peat beds—the water running out from underdrains shows the presence of iron,—and in all our marls in this region there is more or less iron, consequently lime is to us an invaluable assistant.

From what I learn of the effects of our marls in some other localities, for instance, in portions of our adjoining county of Middlesex one load will accomplish more than two loads for us. There are farmers around this locality who do not use as much of the marl as in former

years, though conveniently located to obtain it, or even have it on their farms. Some think they do not obtain the same valuable results as formerly. In such cases the addition of lime, I apprehend, would produce valuable results; others, again, are deterred by the expense and toil and care requisite throughout the winter, in order to get out any considerable quantity. Nevertheless, in the exercise of faith and works with our marls and lime we can speedily bring up our lands to a much higher state of cultivation.

HON. WM. A. NEWELL, Allentown, Monmouth county.

1. Twenty years. Many hundred loads.
2. Squankum, West Jersey Marl Co.'s pits, Vincentown, Pemberton, Woodward, Shelltown, Cream Ridge and New Egypt.
3. From twelve to fifteen loads or tons on young grass; on stubble fields; corn and mowing fields; potatoes.
4. Best on heavy soil and loamy land; requires wet seasons.
5. An especial increase in grass and potatoes; occasionally in wheat and corn.
6. Acts best on potatoes when composted with manure; as a top dressing, or for corn, it don't pay to compost marl.
7. Price varies according to location of pits, from \$1.25 to \$2 a ton. A load of barn-yard manure is worth two or more of marl.
8. Marl is a most valuable fertilizer, and is obtainable in inexhaustible quantities, and so it is very valuable.

N. S. RUE, Cream Ridge, Monmouth county.

1. For the past twenty years, covering from ten to twenty-five acres a year.
2. From my own pits; from Nimrod Woodward's pits, and from the Cream Ridge Marl Company's pits.
3. I have applied from one hundred and fifty to two hundred bushels per acre; I have usually applied it as a top-dressing upon young grass; I have also used it for potatoes and corn.
4. I have found the benefits about equal upon sandy loam and clay soils; the beneficial effects are much more marked in wet seasons.
5. It increases the grass crop from one-third to one-half, and has about the same effect upon potatoes and corn.
6. I have seldom used it composted, but many farmers think it of advantage to use it in that way, causing it to act quicker.

7. When using it from my own pits it cost about fifty cents a ton for digging and hauling; it costs me more when purchased from other pits; about equal in value to barn-yard manure; the cost from the different company's pits is about \$1 a ton, and two cents a mile freight on the railroad; this will enable you to know the cost delivered at given localities.

ALEXANDER COOPER, near Kirkwood, Camden county.

1. I have used marl on my farm every year, without exception, since 1837.

2. The marl is dug on the farm.

3. The first ten or twelve years we used it as a top dressing on young grass. Since that time we use it in compost, with manure, for early potatoes. Much the largest proportion is put on the manure in the row, as it is hauled from the barnyard, for the late crop of potatoes. We endeavor to put on fifteen wagon loads to the acre.

4. As the soil on the farm is uniform in quality, no difference has been noticed in that respect. It is undoubtedly more beneficial in a wet season.

5. As far as my observation goes, it is just as beneficial on potatoes and all other crops as it was when we first began using it in 1837. I believe this is the opinion of the farmers in this neighborhood.

6. On all early truck it is thought best to use it in compost with manure.

7. Having an abundance on the farm, the principal cost is in digging it, which will be from forty to sixty dollars per rod.

8. In looking over my books, I have no doubt that since I came in possession of the farm I have put on at least twenty-five thousand two-horse wagon loads (we have nearly three hundred acres under tillage). I will just say, that in using so much marl year after year, it is the practice in this neighborhood to use Pennsylvania stone lime as a top dressing on young grass, which I do almost every year. If this was not done our farms would be a mass of sorrel.

EPHRAIM TOMLINSON, near Kirkwood, Camden county.

1 and 2. I have used marl some forty years, say from one hundred to five hundred tons a year, with great benefit. I have any quantity of all kinds of marl on my own property, at the head of the north branch of Timber creek.

3. I put to the acre about ten to twenty tons for top-dressing. I have used large quantities for compost for potatoes, mixed with barn-yard manure.

4. I have found it do more good in wet seasons than dry, and I think it does more good on heavy land than on light.

5. I think top dressing is the most beneficial way of using marl—it works itself into the soil. I don't think it matters what way you put it on the ground, so you *get it on*. It will do more good than anything that I have used for a top dressing on new land. I have a farm I purchased just after the timber was taken off. By the use of lime and marl I have got it in a very good state of cultivation. And on meadow land I have put marl where there was nothing but moss, and brought a solid mat of white clover.

JOHN HAY, Winslow, Camden county.

1. Twenty years.

2. Minor Rogers' pits, White Horse, (Kirkwood.)

3. Twenty tons broadcast on new grass. We find decidedly more benefit from using on a new sward than on an old one.

4. More beneficial on low ground naturally wet; in a wet season, beneficial anywhere.

5. We keep our lands in grass longer, and get better crops.

6. We compost it for potatoes; and use marl alone, *only* after wheat, on grass land.

7. It costs \$1.10 a ton delivered here. We consider one load of barn-yard manure worth three of marl.

R. J. BYRNES, Hammonton, Atlantic county.

1. Eighteen years; about one thousand tons.

2. Rogers' pits, White Horse.

3. From four to twenty tons, on different crops and as top dressing without any appreciable results, in its natural state.

4. In heavy soils and wet seasons it can be seen.

5. No benefit in its natural state.

6. When composted with guano or barn-yard manure, we find it a benefit.

7. It costs \$1.40 on farm; as a compost with barn-yard manure, is equal to it ton for ton.

8. We do not use much marl here. It has been tried, (not very

extensively), and almost abandoned. The few who claim for it any merit cannot show any evidence of its value as yet. *All the good* farmers adjoining us, who cultivate older lands, say that without marl they could not farm with profit, and this they prove by the great expense they are under to procure it, many hauling it twenty miles. They claim to be able to show, to a line, where it has been used. Their lands appear to be the same as ours, only older. I have used thirty tons on an acre as a top dressing, and have *seen no results* (or no benefit). As a part of a compost we find it valuable, but to what extent have not ascertained.

WM. WADE GRISCOM, Woodbury, Gloucester county.

1. In common with my neighbors I have used more or less marl for the last twenty-five years; some years using as high as two hundred tons, the amount often depending on the condition of the roads, or the demand of other farm work.

2. I am distant from Heritage's and Bee's marl beds about five miles, we can haul but two loads a day; its cost depends very much on how we obtain it at the pits; for that already dug or in the bank is fifty cents per load of say $1\frac{1}{4}$ tons: the cost by the rod is from twelve to twenty dollars, depending on locality; the farmer doing the work of uncovering makes the cost per ton at the pit about twenty-five cents per ton, and on our farms one dollar to one dollar and a half per ton, the difference in price depending on the state of the roads and whether two or four horses are used.

3. Most of the marl used has been on potatoes, covering the composts and mixing thoroughly through when turned; about ten tons to the acre I think a good amount; this not only benefits this crop but we think it of considerable value to the coming grass crop; we also value it very highly as a top dressing for grass, particularly upon moderately poor ground; it is important to apply it early in the fall to have the most benefit for the next year's crop; I have also used it liberally as a top dressing on grass, *without any apparent difference* in results with where there was none spread.

4. I have seen equally good results on damp meadow land and on dry sandy loam, and think it does best in a wet season.

5. The best estimate of the value our farmers place on marl can be judged by the amount used in the past; with but few exceptions farmers always expected to start a team as soon as the corn was

husked and kept it going all winter ; this practice was kept up until about three years ago, when, for some unexplained cause, marl hauling almost ceased ; intelligent farmers would say they thought their ground had enough marl ; that it cost too much for the amount of good it did ; that manure was cheaper and produce too low to warrant the expense, and perhaps some stopped because others did ; my reasons for stopping were that the cost, wear and tear and exposure were considerable, and the results, as far as we could measure them, unsatisfactory, and access to Philadelphia being easy, over good roads or by navigation, I thought stable manure would be more satisfactory, and I think it will prove so ; to those not so favorably situated to get stable manure, and who have access to marl, it must continue to be a valuable aid in improving the land, even should they have to haul it further than five miles ; I have often thought that from the amount of fertilizing ingredients it contained, as per analysis, we did not receive corresponding good results, and that it may perhaps be owing to a large portion of the phosphates or potash being insoluble ; could it not be treated with some acid to render these available, if this is the condition ?

WM. A. COOMBS, Upper Pittsgrove, Salem county.

1. From 1832 up to the present time ; from one hundred to two hundred tons a year.

2. First from Riley's and Shinn's pits, near Woodstown, and Dickinson's, on another branch, near Sharpstown, and from the West Jersey Marl Company, Gloucester county.

3. We use from eight to ten loads to the acre on grass, which, after the grass, leaves the ground in good condition for another crop.

4. I think it more beneficial in wet seasons than in dry, but always some benefit, excepting on wet land.

5. I have composted with manure for potatoes with good results, following with wheat ; this gives a good crop.

6. After I used marl ten or twelve years the sorrel came in to some extent ; then I used lime, which seemed to eradicate it in a measure, until finally it is nearly out.

7. It costs fifty cents per ton at the pits ; we have hauled it from ten to eleven miles, making it cost \$2.50 per load or ton ; I have used two hundred tons some years, but more or less every year.

8. I have observed that we get the best results from marl on land

that has never been marled ; after using it some time it does not act as at first ; but it has been of great benefit to our section of country.

ROBERT VAN METER, Elmer, Salem county.

1. I have used it to a considerable extent for thirty-three years.
2. Latterly from the West Jersey Marl Company.
3. About eight loads per acre, on grass.
4. No difference on soils, but better in wet seasons.
5. Good results.
6. I have not.
7. It costs me one dollar and fifty cents per ton. Not to be compared with barn-yard manure.

JESSE LIPPINCOTT, near Oldman's creek, Salem county.

1. I have used marl for thirty years, and from one hundred to four hundred tons per year.
2. From Lippincott's pits on Oldman's creek, the county line between Gloucester and Salem counties.
3. I use from ten to fifteen tons as a top dressing for young grass. This has been most beneficial, often doubling the crop of hay.
4. Most beneficial on loamy or clay soils. Much more beneficial in wet seasons.
5. I have many times seen it more than double the grass crop. And when the land has come in corn, the difference has been as great.
6. It makes very good compost, mixed with barn-yard manure, for potatoes.
7. The cost from these pits is fifty cents per ton. For grass I consider it equal to barn-yard manure.
8. The fact is, if you have good marl convenient, it does not make much difference how you use it ; the main thing is to get it on the land.

SAMUEL M. LIPPINCOTT, near Woodstown, Salem county.

1. From 1833 to 1875 ; one hundred to five hundred loads yearly.
2. From Riley's, now Dickinson's pits, Cawley's pits and Lippincott's pits, all near Woodstown.
3. From ten to twenty loads per acre. The best result on young clover ; on Irish potatoes good results. Some use it broadcast, some in the row.

4. On loamy or heavy soils better results than on light. In wet seasons, large results ; dry seasons, no benefit.

5. I have applied it to young clover and timothy in August and received large results ; on Irish potatoes, good crops ; on all kinds of grasses a benefit. The farmers have received good results from marl in this neighborhood.

6. I have composted with barn-yard manure, covering the compost with marl, and received benefit from it.

7. It costs from forty to sixty cents a ton at the pits. The cost of hauling depends upon the distance they have to cart. I have known them to cart from one to six loads a day. At the present time I would prefer barn-yard manure.

8. The farmers have not received much benefit from marl for five years past, on account of dry seasons and failure of the grass to take. They have not carted as much as in former years on account of the hard times.

OMAR BORTON, Woodstown, Salem county.

I have answered none of your questions in the circular, having had but little personal experience with marl, but I have made an arrangement to have you receive an account of the use of marl from one of the old residents of Pittsgrove township. I only say that *marl has made us what we are*. And I would also say of Pittsgrove, that marl has been carted into that township such a distance that the teams took but one and a half loads per day.

FRANK PETTIT, Salem, Salem county.

1. I have been using marl more or less ever since I have been farming, and my father used it as long ago as I can remember.

2. I have always got my supply from the Pettit marl beds, which belong to the Middle Bed.

3. I apply about twelve tons per acre, and find it most convenient or beneficial to apply it in August or September, on wheat stubble, on the present year's *catch* of grass, for next year's mowing or pasture. I find it most beneficial to corn, grass and potatoes. I have never seen any direct advantage to wheat, but indirectly by an increased growth of clover. I have seen an increase of fifteen bushels per acre, at least. Marl does more good at a first application than a subsequent one does.

4. It is but little advantage a very dry season. A wet season it is always beneficial. It seems to give "backbone" to land if the soil is naturally good where it is applied and the season favorable. A fair crop may be expected after a lapse of years, when it would be expected that all fertilizers would be worn out.

6. I have never found it necessary to compost it in order to benefit the marl, but the marl might prevent over heating in the manures. I think if the manure should get hot enough to benefit the marl, its own value would be very much impaired.

8. In my mowing field, last summer, I noticed a strip of grass running the whole length of the field, that only cut about one ton per acre. The balance of the field cut three tons per acre. This field had had on it about seventy loads of muck per acre, which alone did no good until an application of limesand was given. Since then it has been very productive. The strip alluded to above had no limesand on it. The grass seed had been sown crossways of the strip, hence it had as much seed sown on it as the rest. All fertilizers applied on this field subsequent to the putting on the limesand had also been applied crossways this strip, hence the difference in the grass can only be attributed to the limesand. This limesand answers the place of burned lime as a fertilizer, and while it is equally effective it cannot possibly do any harm. I know of another case where limesand was applied to all of a field, excepting four corn middles, some thirty years ago. The advantage of the lime is still shown by an excess of at least twenty-five per cent. of grass on the limed part.

ABNER ALLEN, Deal, Monmouth county.

1. I have used marl for twenty-five years, more or less, and when I first begun to use it I put several hundred loads on my farm.

2. I carted from my own pits on my farm.

3. I put on from twenty to twenty-five loads to the acre, spreading it broad cast for grass and potatoes. Those are the crops that return most benefit. I have also used it to make the clover seed stick (on rye or wheat in the winter).

4. I find it does more good on low or damp meadows. And it makes quite a difference on any soil in a wet season.

5. I have found a very great benefit in the grass for hay or pasture, both in the quantity and in the quality. It seems more hearty, and the cattle feed it down more as pasture.

6. I generally use it broad cast, and then spread barn-yard manure on with it. I plow it under for potatoes, and I like to lime after using marl freely, as without lime sorrel comes.

7. As I have it on the farm it costs about twenty to twenty-five cents a load (twenty bushels) to dig, cart it and spread it broad cast. I do not think anything is as good as barn-yard manure for a permanent fertilizer.

8. I think that marl, lime, or either, used separately to a large extent, will not give as good crops as if used together. After using them; then I find that barn-yard manure makes decided results.

JOHN F. T. FORMAN, (lately deceased,) Freehold, Monmouth county.

1, 2 and 3. In 1824 I was induced to try the Squankum marl on an old, wornout farm, much of which had not been plowed within the recollection of the oldest inhabitants. I applied five or six loads of twenty bushels each on an acre, for buckwheat or rye. The effect of it was so great that the use of it became general, and the farms increased rapidly in value, from ten dollars to one hundred dollars or more, per acre. As the land increased in value, the amount of marl was increased to twenty loads an acre, always producing the greater effect when composted with manure

4. I have not noticed any difference in wet or dry seasons. Much greater effects may be looked for on heavy clay sub-soil than on sandy.

6. I think that alone its effect is more marked upon rye and buckwheat, than upon other crops. For wheat or other crop I prefer it composted.

7. I think the cost at the pits, when dug, is about seventy-five cents a load, twenty bushels. Two loads can be hauled seven or eight miles in a day. I consider it equal to barn-yard manure, load for load.

8. I have used a large amount of marl from the Uriah Smock pit, at Marlborough. It is used largely in the neighborhood of Freehold, and in the country within five miles of this place, and with the most satisfactory results. I think a coat of this and the Squankum marl would improve the soil more than two applications of either one, and that thus they would compare favorably with barn-yard manure.

I consider the marl a valuable top dressing for grass, thus renovating old grass land without the expense of plowing.

The Squankum marl was first brought to notice and used as a fertilizer about 1820, by Aaron Chamberlain, who having occasion to cross a meadow on the farm of the late John B. Thorp, through which a ditch had been dug, cutting into the marl, noticed a perceptible difference both in the quantity and quality of the grass growing there. He was induced to carry a basketful of it home for experiment. The result was such that the whole neighborhood was wild with enthusiasm, believing that the time was near at hand when these barren fields would be brought to great productiveness, which, by hard labor and energy, has been realized. And now, where stood the log cabin, whose furniture consisted in part of rude benches, home-made tables, chairs, a cradle, a spinning-wheel, and a few other necessary articles, may be seen large and handsome houses, with their mahogany chairs and sofas, and in place of the spinning-wheel one of Chickering's best pianos. This change is due to the use of marl.

As a reward to Mr. Chamberlain for his discovery, he was granted the privilege of hauling as much marl as he wished, gratuitously, which privilege he used prudently during his life, and made his farm very productive. The opinion at that time prevailed that it would not pay to haul it more than two or three miles.

F. L. BUCKELEW, Jamesburg, Middlesex county.

1. Have used marl over twenty years; for the last seven years have averaged over five hundred tons, (twenty bushels to the ton.)

2. Supplied by the Squankum and Freehold Marl Company, by railroad.

3. Use about four tons per acre; some use more. We use more with potatoes. Use it on rye, grass, buckwheat, and sometimes again on land the third year it has been in sod, as well as when it was first seeded. If the wheat crop is well supplied with other fertilizers, prefer the marl applied on the stubble the following fall and winter for the benefit of the young grass.

4. Moderate clay and loamy soils show the best result from the use of marl. It greatly benefits rye on sand if the season is not too dry.

6. Do not compost much with marl; use it to cover the manure

heap when it is to lie long exposed, and mix it through as the heap is turned.

7. It is delivered here by the side of the railroad for \$1.90 a ton. The cost of applying to the land is about the same as the same weight of barn-yard manure; cannot well compare it with barn-yard manure. It is not worth as much as some, and much better than others. Think that either is benefited by the other.

W. E. BARRETT, Superintendent of the Squankum Marl Company,
Farmingdale, Monmouth county.

1. For ten years past, from one thousand to ten thousand bushels per annum.

2. From the pits of the Squankum Marl Company, which are about two miles from Farmingdale, on a branch of the New Jersey Southern Railroad, belonging to said marl company.

3. For a top dressing of grass or grain crops about two hundred bushels per acre. For potatoes, if broadcast, about three hundred to four hundred bushels; if put in the hill, two hundred bushels. I prefer broadcasting, as after the potatoes the marl not appropriated by them is thoroughly mixed with the soil and in readiness for any other crop. And there is no crop which is not benefited by marl.

4. My experience does not extend to a great variety of soils. My farming has been on light sandy or gravelly soils, where I have found great benefit from it, wet or dry. In the season of 1876, one of unusual drought, my crops of grass and corn were unusually large.

5. On grass and grain largely increased crops. In potatoes an improvement in quality and quantity. Potatoes raised in marl have a smooth, bright skin, and are free from the worm-eaten appearance so often seen. On *cranberry vines* increased growth of vine and size of berry. I have also found it beneficial to fruit trees.

6. Useful to compost with barn yard manure for most crops. For potatoes I prefer marl alone, as raising an equal quantity and of handsome appearance. I think well of using other manures occasionally, particularly when a rapid growth is required, relying upon marl as the main fertilizer for permanent benefit to the land.

7. My marl is carried fifty miles by railroad and then carted three miles, and costs me about fifteen cents per bushel, on the land. It is sold at the pits for three cents a bushel. I consider it equal in

value to the best barn-yard manure, and more permanent in its effect. If I could have but one I should take the marl.

8. I am not a practical farmer, but am connected with a farming enterprise near Tuckerton, and gather the above views from results there, and the experience of those who buy marls there. The effect of marl at the Tuckerton place is suprising. It had never been used there until within the last five years. This was on old lands where no hay had been cut; we cut over fifty tons last year—the effect of marl.

I would also remark that I think marl is destined to be largely used in cranberry culture. Parties who have experimented in that direction inform, me that the results are increased vigor in the growth of the vine, and largely increased size of the berry. I applied a considerable quantity on vines last fall, and shall watch the result with much interest.

I am almost ashamed to give statistics of annual sales. Owing to the hard times and the ravages of the potato bug, our sales were not much more than one-third the usual amount, being about two hundred thousand bushels. Our prices are three cents per bushel at the pits, and at points on the New Jersey Southern R. R. and branches, six to twelve cents per bushel, according to distance. We have a large list of customers who cart marl from the pits distances of one to fifteen miles, many of whom have carted annually for ten to twenty years.

THOMAS JOHNSON, Toms River, Ocean county.

1. For twenty years, with good results; for the last five or six years have used from three to four thousand bushels a year.

2. I have used both Squankum and Farmingdale.

3. I put from one hundred and fifty to two hundred bushels per acre on grass.

4. It does the most good on light soil.

5. It benefits grass, corn and potatoes.

6. If used in small quantities I find it best composted with manure.

7. It costs about nine cents a bushel to get it on the land.

THOMAS B. JOBES, New Egypt, Ocean county.

1. Have used and observed its effects for a period of forty-five years. Have put as much as forty tons per acre on my farm in the last thirty-one years.

2. At first the green marl and shell-marl of the middle bed, from B. H. Horner's pits, near New Egypt.

Lately the green marl of upper marl bed, from T. Wildes' (Dutcher) pits, southeast of New Egypt.

3. At first put on ten to fifteen tons; now spread thin, six to eight tons per acre, on young grass. Do not marl clover on a wheat stubble any more, because the compost applied to the wheat and then the marl will together lodge clover. Apply the second or third year, or before the next crop of corn, on bottom meadows, about the same amount once in six to eight years.

4. In every dry season do not see much benefit to grass. On all soils in southern New Jersey it is beneficial; on nearly all it is a permanent improvement.

5. A gradual improvement of the soil for a certainty and in general, an increase of the first or second crop of grass, and increased yield of corn. Have marled sod and plowed for corn always with success.

6. Have never composted. The price per ton at the pits, say forty cents, dug, and the distance, two miles, makes the handling cost more than any advantages promised by composting.

7. Marl has never cost me more than fifty cents per ton, of twenty cubic feet, as measured in the bed. We haul four tons daily say, costs seventy-five cents per ton cartage. The average cost at the pit has been about forty cents, that is for marl dug and ready to load.

JAS. A. FENWICK, New Lisbon, Burlington county.

1. For thirty years or more, and have used several hundred tons every year.

2. Generally from the side of the creek, about a mile and a half above Pemberton; also from the Pemberton Marl Company's pits, and other places nearer home.

3. Once in every rotation use about eight or ten tons per acre on the young grass. If possible, the rotation on the lighter fields is, first, corn or potatoes; second, winter grain, with grass seed, marl the young grass in the stubble; third, mow or pasture one year, followed by corn again (once in four years). The fields better adapted to grass are retained two to three years in it. The marling comes then once in five or six years. Potatoes in the hill also.

4. I have found it most beneficial on soils that have been cropped

for some time without marl. Soils entirely exhausted have failed to show good effect until followed by other manure; but it showed then markedly.

5. On soils producing light crops of clover a dressing of marl will double the crop, and increase largely any crop of clover on any soil in this part of the country, as can be plainly seen on any part of any fields that happen to be missed in the rotation, and the land appears to be permanently improved. My whole farm produces twice as much as it did, since the application has been kept fully up in every rotation. A neighbor put marl on potatoes in hills, on poor soil just cleared of pine, using plaster on others, and leaving unmanured. In others a handful of manure with the marl. I examined the hills just before digging, and found the result to be about this:

I. Hills without manure: potatoes almost nothing.

II. Hills with two handfuls of manure: good saleable potatoes.

III. Hills with two handfuls of marl and a handful of manure: double that with marl.

IV. Hills with the plaster: better than the first, but not so good as the marl.

If in some lime and in others stable manure had been used, it would have been a complete trial.

I saw a neighbor use marl, one-third of a shovelful to a hill of potatoes on part of a field. The wheat following, and the grass after that all showed a distinct line across the field, of increased growth and luxuriance. And I have seen many other cases as strongly marked.

6. Compost marl, with barn-yard manure, for potatoes in the hill. I think that thus its value is very greatly increased. With five tons of marl, and five of manure, can get a fine crop of potatoes, even on thin soils.

7. Its cost is to me about forty cents a ton at the pits. My two teams, that are necessary to work the farm in the summer, cart all I want in the fall, winter and spring, when not busy with other farm work.

The compost trial proves that used thus it has more value per ton for potatoes than stable manure, and also when used on young grass it has more value than stable manure; but it would not be if there were not cattle to feed, and consequently manure at home.

Farms near here, poor, naturally, as shown by the stunted timber,

or those overworked, have been made rich by marl and good farming alone. And they maintain that richness with no other source outside of the farm but a little lime.

CONCLUSIONS.

From these letters, detailing the results of experience, together with the chemical analyses, the following conclusions may be drawn :

I. That the most valuable marls, and those which will best pay the cost of long transportation, are those which contain the largest percentage of phosphoric acid. The phosphoric acid is combined with lime, and is easily soluble in citrate of ammonia, and its value is the same as that which on page 28 is set down at eight cents a pound.

II. That the most durable marls are those containing carbonate of lime, the more the better. The carbonate of lime is in the form of a very fine white earth or powder, and is much more valuable than that in hard shells.

III. That the potash in the marls has but very little, if any, present value, it being combined with silica, and so insoluble.

IV. That greensands containing but little of either phosphoric acid or carbonate of lime, become active fertilizers when composted with quick-lime.

V. That marls, which are acid, and burning from containing sulphate of iron, can be rendered mild in properties and useful as fertilizers by composting with lime.

VI. That crops particularly improved by it are all forage crops—grass, clover, etc.; for these the green marl may be spread upon the surface, to the amount of from one hundred to four hundred bushels per acre. The crop is generally doubled, and in some cases quadrupled, by this application. Other marls must be used in larger quantities, but will produce good results.

Potatoes. For this crop marl seems to be a specific. It does not materially increase the growth of vines, and the yield is not much greater, but the potatoes are smoother and fairer in the skin and dryer and of better quality when boiled. The marl is put on the potatoes in the hill at planting; if not acid, it is thrown directly on the tuber; if acid, the potato is first covered by earth and the marl

thrown on or beside that. From five to thirty tons may be used on an acre.

Buckwheat. Most remarkable effects upon this crop are produced by marl. Two and a half tons or fifty bushels to the acre, spread on after sowing, have caused an equal amount of buckwheat to grow on land which otherwise was not worth cultivating.

Wheat, rye, oats and corn, are improved by the use of marl, though not with the striking results seen on the crops before mentioned. It is applied as a top-dressing on the prepared ground, is spread on the surface before plowing, is worked in the hill or drill, or is composted with barn-yard manure and spread on the ground according to the farmer's judgment. From five to thirty tons and even more may be used upon an acre.

With any kind of garden or field crop it may be used, and will be beneficial both to the crop and soil. It is free from the seeds of weeds, is dry, and convenient to handle—all of which recommend it to any good farmer.

DIVISION II.

TERTIARY MARLS.

MIOCENE MARL.

At several places in the southern part of the State, and southeast of the greensand marl district, clays, sandy earths and marly clays, all termed *marls*, are dug and used as fertilizers, although confined in their use to limited areas, near where they are obtained. A chocolate-colored earth appears bordering the Upper Marl Bed, and lying unconformably upon it at Deal, Shark river, Squankum, New Egypt, Poke Hill, and near Pemberton along the creek; and further southwest on David Marshall's land near Blackwoodtown; on the south branch of the Raccoon creek, near the Commissioners' road; on Oldman's creek, east of Harrisonville; at Dickinson's mill, east of Woodstown; and at other points slirting the greensand marl region. Further southeast this earth, or *marl*, has been dug near Bennett's mills, near Toms River and near Woodmansie, in Ocean county. In some places it is known as "rotten stone," in others as strong marl. It is quite uniform in character, and is a sandy clay, finely laminated, of a chocolate color, and often having an inky taste. It often contains fragments of wood, and in places shark's teeth and fish bones occur in it. Sulphate of iron or copperas characterizes it at nearly all of these localities. It has been tried upon land and with favorable results. Care is necessary in using it, as large amounts are injurious to vegetation. This tendency is counteracted by mixing lime with it. It is at best an indifferent and inferior fertilizer, adding but a very small amount of plant food to the soil. It may, in some places, improve the texture of the soil. It cannot be regarded as a fertilizer, excepting at the few points where it occurs at some distance from the more valuable greensand marls. And the term *marl* is a misnomer.

SHILOH OR CUMBERLAND MARL.

This marl occurs in limited outcrop along several small tributary streams of Stow creek, in Salem and Cumberland counties. The extent of the outcrop in a northeast and southwest direction is about three miles. Its breadth is not over half a mile. Pits have been opened on several farms, all near the several little streams or runs flowing through this area to the Stow creek. The dip of this marl bed appears to be gentle towards the southeast, corresponding to that of the green sand marl beds. The "stripping" or overlying earth, sand, gravel, &c., varies greatly from three to fifteen feet in thickness. The top marl is generally black; under this is the main body of the bed, consisting of a grey calcareous layer with numerous shells, and from ten to fifteen feet thick. Sometimes a reddish yellow earth appears at the top, over the black marl; these may be the grey altered by atmospheric agencies. At some of the pits there is on top a stony layer full of silicified oyster and other shells. The grey marl is very uneven, both on top and at the bottom. This grey marl consists of fine sand, with a little clay and a varying amount of carbonate of lime. Besides the finely comminuted calcareous matter, most of these marls contain many fossil shells which readily crumble on exposure to the air. In places the whole mass appears to be made up of decaying shells. These shells prove that the bed is of the miocene epoch of the Tertiary Age.

The composition of the grey marl, as determined by two analyses, is as follows:

	1	2
Silicic acid and sand.....	59.30	50.20
Oxide of iron.....	3.07	3.28
Alumina.....	2.84	1.95
Lime.....	15.30	19.71
Magnesia.....	0.69	0.50
Potash.....	0.97	.....
Soda.....	0.58	0.63
Sulphuric acid.....	3.56	2.09
Phosphoric acid.....	0.45	0.70
Carbonic acid.....	9.00	15.05
Water.....	2.80	6.15
	<hr/> 98.56	<hr/> 100.36

No. 1 is an average sample from Ayar's pits.

No. 2 is an average of the upper portion (eight feet) of the grey marl at Minch's pits, located near the turnpike, on Horse Branch. These analyses show the large proportion of carbonate of lime in this marl, quite as much as in the best and most calcareous of the green-sand marls of the Lower Marl Bed. The phosphoric acid and potash are present in small per centages. The following analysis shows the composition of the black marl dug at Hummel's pits:

Silicic acid and sand.....	65.53
Oxide of iron.....	6.08
Alumina.....	5.59
Lime	2.71
Magnesia.....	2.65
Potash and soda.....	1.12
Phosphoric acid.....	2.00
Sulphuric acid.....	6.70
Organic matter.....	2.12
Water	5.17
	<hr/>
	99.67

This marl is acid in its reaction, containing an unusually large amount of sulphuric acid, most of it probably in the form of sulphate of iron or *copperas*.

A reddish yellow marl from Minch's pits contained:

Silicic acid and sand.....	85.90
Oxide of iron and alumina.....	7.60
Lime.....	0.62

This miocene marl may therefore be considered as a sandy earth, with more or less calcareous matter.

It is estimated that this marl supplies a district of country about fifteen miles in diameter, going east towards the Cohansey creek, north and northwest to Deerfield and Allowaystown, and south to Greenwich. As most of the marl lies below the surface drainage of the country, there is much trouble from water, and digging is thus attended with considerable expense. The first pits in this marl dis-

trict were dug in 1819, but its general use began only about forty years ago. The grey marl is most largely used, and its beneficial effects are mainly owing to the carbonate of lime which is in it in the form of an impalpable grey powder, and in the broken shells distributed through it. For some special uses the yellow and the black marls are sometimes preferred. This may be owing to something in their physical rather than in their chemical constitution, still the grey marl is undoubtedly the best, and the experience with it is very similar to that with the blue shell marls of Monmouth county. It is a *lasting* fertilizer, improving the soil permanently. The general practice in using it is to put it on broadcast on sod ground previous to corn, in dressings of ten to twenty tons per acre. The accompanying letter gives the mode of applying it, and other practical details :

LEWIS HOWELL, Shiloh, Cumberland county, gives answers to the same questions as those for greensand marls.

1. Forty years ; from one hundred to two hundred loads a year. Farm of eighty-five acres. The productiveness of some parts of it has been increased from five bushels of corn per acre to fifty.

2. Principally from pits along Horse Branch, near Marlborough church, Salem county, now owned by Minch & Howell.

3. On poor worn-out land fifteen loads, of twenty bushels, or one ton each, ought to be used per acre. After a few years a second dressing of ten loads per acre will be of great use. Crops of buckwheat stand foremost as most immediately benefited, often producing twenty bushels per acre, where nothing would have grown without marl. Turnips and cabbage are next in order most benefited ; then clover. After a good crop of clover, then you can raise anything. It should be used invariably—applied on the top of the ground.

4. In my opinion, is more useful on clay than on light, sandy soils. However, both are found largely benefited by it. I have found but little difference in wet or dry seasons.

5. The benefits from its use in our section have been to make our unproductive land at once productive, and it has raised the value of hundreds of acres of worn-out land from five or ten dollars an acre to one hundred dollars per acre.

6. It is not necessary to mix with other manures, but decided advantages are derived from mixing with barn-yard, stable, or hen manures or guano.

7. It can be procured at all the beds for fifty cents a ton. Cost of carting, fifty cents to a dollar, according to distance. Its lasting qualities make it much more valuable than barn-yard manure, excepting the immediate crop of corn or wheat; on these crops manure shows results immediately. For buckwheat and clover, barn-yard manure is not so good for the immediate crops as marl.

8. There is no kind of manure which we find to be so lasting in its effects as the shell marl of this vicinity. Ashes approaches nearer than anything else, but marl in my opinion has the precedence. I marled an acre heavily forty years ago, say twenty loads per acre; since that time the whole field has been marled and manured alike, but still *that acre* is ahead of the other parts in fertility. Nearly one-half of the eastern part of our township, lying on the creek, depends still more or less upon meadow hay for manure, and uses but little marl. The effect of this is to keep them down in the valuation of their land. That part of the township where little marl is used, is valued from thirty to fifty dollars per acre. Where marl has been liberally applied, the valuation is from sixty to one hundred dollars an acre, on present duplicate. I was assessor before the marl was discovered. At that time the valuation of that part of the township nearest the creek was the highest.

DIVISION III.

CALCAREOUS MARLS.

SHELL AND OTHER CALCAREOUS MARLS.

These terms are applied to deposits of lime from solution in water. They occur generally in springs, ponds, shallow lakes, and low marshy lands.

The deposits of shell marl are quite numerous, but all of them are found in the counties of Sussex and Warren, and in limestone districts. Some of them cover large areas, while others are limited to meadows of a few acres in extent. The localities of its occurrence, with a few details, are here enumerated. Beginning on the north-east, it is said that there is a large deposit near Roe pond, on the east side of Pochuck mountain. It has been used with good results by farmers of the vicinity. This marl has been reported as existing under the muck in the meadows along Black creek, in Vernon township. Another deposit of shell marl is found in the meadows east of North Church, Hardyston township. It also occurs in the same township on the Fowler estate farm, near Mud pond. This marl has been used with injurious results, probably due to applying it too largely.

The Paulinskill meadows, near Newton, have this shell marl covered by a peaty surface from three to four feet thick. It has not been used because of the difficulty in getting it out, as the meadows are very wet. The deposit is said to be between two and three feet thick. Its extent is unknown. It may stretch throughout most of this large tract of meadow. Shell marl has been discovered near the outlet of Davis' pond, about half way between Newton and Andover, and west of the Sussex railroad. It is owned by S. R. White, of Andover. Southwest of Andover there is a beautiful bed of marl near Decker's pond, on the farm of Job J. Decker. It is

west of the iron mine, and covers several acres. A ditch dug through the meadow exposes the white pulverulent marl, containing a few perfect shells in with the comminuted shelly mass. Mr. Decker has dug into this deposit six feet without finding its bottom. Nearer the pond the turf is thicker, covering the marl. None of it has ever been used, although the ease of getting it renders it a valuable one. At the head of the pond there is a similar deposit, but not so large.

Shell marl occurs near Reding's pond, southwest of Springdale, near Catfish pond, one mile west of Stillwater, and probably at many other localities in that portion of the Kittatinny valley, in Sussex county. Many of the wet meadows will, on exploration, be found to contain deposits of this marl covered by thin peaty layers.

In Warren county this marl is not so abundant, excepting in that portion of the county adjoining Sussex. It occurs near and along the shore of White pond, north of Marksboro. The shores of this pond are white with it, and hence its name. It is said to be eight to ten feet thick. On the farm of Peter Lanterman, south of Blirstown and northeast of Buttermilk pond, is another shell marl locality. Three or four feet of muck overlies it at this place.

About one mile southwest of Hope, along Mud brook is another marl deposit, where it is said to be four feet thick, under from two to four feet of muck.

The most extensive deposits of this marl are found in Montague and Sandiston townships, west of the Blue or Kittatinny mountain. That on Isaac Bonnell's farm along Chamber's mill brook, is supposed to extend over seventy-five or one hundred acres. Along the Little Flatkill there are two large deposits. One is on the farm of I. Cole, two miles southeast of the Brick House, and occurs over an area of fifty acres. The other is north of Hainesville on the farms of Isaiah Van Etten and Samuel Clark, and is said to cover about twenty acres. Near Peters valley are two deposits, one on James C. Bevans' lands northwest of this village, and the other north of it on farms of John Schooley and Ben. P. Van Syckle.

At Dingman's Ferry there is a deposit of calcareous sinter or travertine about four hundred yards long, stretching from the large spring or subterranean stream westward to the river. It may average fifty yards in breadth. Its thickness is not known. Most of this bed is quite soft and earthy, though there are in it stony masses which

might be burned into lime. The deposit at Van Syckle's may cover an acre of ground; and no bottom was found in digging seven feet into it. Mr. Van Syckle is fully satisfied as to its value. The Dingman's Ferry locality has never been worked. The earthy portion would do well as a marl, while the stony portions could perhaps be burned into lime.

Very little shell marl is yet employed in the agriculture of our State. It has hardly been tried enough to say what is its value as a fertilizer. Two or three individuals have used it with benefit. Isaac Bonnell, of Montague, used it at the rate of eighty bushels per acre, and saw good results from it; James C. Bevans, near Dingman's Ferry, experienced like favorable results.

On ordinary uplands it is best used as a top dressing on clover or meadow ground.

Two samples from Isaac Bonnell's farm, in Montague, Sussex county, analysed by Professor Henry Wurtz, yielded eighty-nine per cent. of carbonate of lime.

A specimen from Job J. Decker's, one mile southwest of Andover, yielded ninety per cent. of carbonate of lime. A specimen of the calcareous sinter or travertine, near Digman's Ferry, yielded ninety-one per cent. of carbonate of lime.

FORMULA FOR HOME-MADE PHOSPHATE.

FROM SAMUEL F. WOOLEY, ALLENTOWN, MONMOUTH COUNTY, N. J.

Combination for one ton of the Star Bone Phosphate.

600 lbs. Bone Dust,	10 lbs. Nitrate Soda,
200 " Oil Vitriol,	50 " Muriate Soda,
150 " Sulphate Soda,	300 " Gypsum,
7 bushels dry Earth or Sand.	

Mode of Preparation.

Put half the bone in a box at a time, then half the sulphate soda; then half the nitrate soda; then half the muriate of soda or salt; then dampen with water and mix through, after which pour on half the oil vitriol; as soon as it begins to smoke let two hands stir as fast as they can, until it quits smoking; then take half the amount earth and mix; at last put in half the plaster and mix thoroughly. The phosphate has been used on wheat principally in this section, but we have used it on potatoes with very good results: we put, say a half teacupful scattered on a foot square, *after kicking dirt on the potato.*

Cost per ton, about \$18.00.

Mr. Wooley reports that this is as good as the common superphosphate, and costs much less.

LEGISLATION.

[LAWS OF NEW JERSEY, 1872. PAGES 41-45.]

AN ACT to establish a uniform system of weights and measures in this State, and to provide for the appointment of a State Superintendent and Inspector of the same.

17. *And be it enacted*, That the bushel of wheat in this State shall consist of sixty pounds ; of rye or Indian corn, of fifty-six pounds ; of buckwheat, fifty pounds ; of barley, forty-eight pounds ; of oats, thirty pounds ; of flax seed, forty-five pounds ; of clover seed, sixty-four pounds ; of potatoes, sixty pounds ; of sweet potatoes, fifty-four pounds ; of beans, sixty pounds ; of peas, sixty pounds ; of onions, fifty-seven pounds ; of dried peaches, thirty-three pounds ; of dried apples, twenty-five pounds ; rated by the standard pound avoirdupois weight.

Passed March 25, 1872.

THE NEW JERSEY CRANBERRY GROWERS ASSOCIATION

Have experienced difficulty from the irregular and sometimes diminished size of the packages marked as bushels, pecks and barrels, which has led to their adopting regulated measures for the size of each of these ; to their supplying the brand of the Association to manufacturers of boxes, crates and barrels, and to their issuing the following notice :

THE BRAND



N. J. C. G. A.



Burned or stamped on this package is that of the NEW JERSEY

CRANBERRY GROWERS ASSOCIATION. It is a guarantee of full size, and is intended to prevent imposition and fraud. The following are the sizes on which it is authorized :

BOXES OR CRATES.		BARRELS.	
Bushel.. $8\frac{3}{8}$ x12x22 in.	} inside } measure	Depth..... $25\frac{3}{8}$ in.	} inside } measure.
Peck.... $8\frac{3}{8}$ x 6x11 "		Diameter Head.. $16\frac{1}{2}$ "	
		Diameter Bilge.. $18\frac{3}{4}$ "	

DISEASES OF DOMESTIC ANIMALS.

CONTAGIOUS PLEURO-PNEUMONIA. BY J. C. HIGGINS, V. S., MILLSTONE, SOMERSET COUNTY.

Pleuro-pneumonia, otherwise known as the rinderpest, the Russian cattle plague, or the steppe murrain, is now spreading rapidly throughout Germany. The ravages it has wrought, whenever it has been allowed to spread, have been enormous. Within the last two centuries and a half it has destroyed hundreds of millions of cattle in Europe. In 1859 the disease was introduced into this country, through an importation of cattle from Holland, by Mr. W. W. Chenery, of Boston, Massachusetts, but owing to prompt measures being adopted it was prevented from spreading to any great extent. Commissioners appointed by the State of Massachusetts were ordered to extirpate the malady, by killing and burying all infected herds, and this has finally proved to be, both in this and other countries, the cheapest way of getting rid of contagious pleuro-pneumonia, as it does not admit of treatment. Our government has now prohibited the importation of neat cattle, as well as the hides thereof, into the United States from Germany. This is a wise precaution against having so unwelcome a visitor among us. The rinderpest is propagated only by contagion, and it is possible therefore to prevent its ravages by stopping the transportation of affected animals. Inoculation has been tried of late years to a considerable extent in different parts of Europe, but so far it has proved unsuccessful as a preventive.

EPIZOOTIC PNEUMONIA.

Epizootic pneumonia, prevailing under the names of typhoid pneumonia, bastard peripneumonia, &c., should not be confounded with the European scourge. The latter is produced by an entirely different specific poison from the former, and I do not believe that it now exists anywhere upon this continent. Epizootic pneumonia, however, always has, and still prevails to a considerable extent in certain localities—especially in the eastern portion of North America—among cattle, and horses as well. It appears sporadically, also as a sub-epizootic, and sometimes as a wide-spreading epizootic.

Causes.—The general predisposing causes are atmospherical extremes and vicissitudes, especially prolonged cold and moisture, combined with defective food, and crowding together of large numbers, with but limited opportunity of inhaling air, while they are still exposed to its inclemencies. It also seems capable of being propagated by contagion. Drovers of cattle are frequently brought to the eastern cities, and when they arrive are affected with this complaint.

In the majority of cases it is not communicated from them to other cattle, but when these affected animals are allowed to remain with a herd of sound ones for any length of time, a few may contract the disease, and sometimes, if the location should be favorable, the whole herd may become diseased, and thus it may be extended over a large scope of country.

Symptoms.—The symptoms are those common to pneumonia, with the addition of a severe nervous depression, and greater prostration. The eyes are red and watery. There is always a short suppressed cough, and a difficulty of breathing. The tongue is usually coated with a yellow mucus, the skin hot, and the pulse accelerated. Auscultation apprises us of the crepitant rhonchus.

Crepitation soon extends over the greater or less extent of both lungs, and the difficult breathing speedily becomes so intense as to be panting.

Treatment.—As this disease is a specific fever, characterized by pure debility, no permanent good can possibly result from antiphlogistic remedies. In all cases we should from the commencement

endeavor to strengthen the patient. Bleeding, purging, and sedative medicines, as aconite, digitalis, etc., increase the prostration without benefiting in any commensurate degree the pulmonary disease. Diffusible stimulants should be employed, such as sesqui-carbonate, and the aromatic spirits of ammonia, nitrous ether, etc. During convalescence, gentian and cinchonia barks and acetate and citrate of iron will be found useful tonics. Counter irritation should be applied to the chest. Give tepid saline waters to drink, pure air to breathe, and a carefully selected diet. By employing these means the lives of many animals can be saved.

MOUNT HOLLY, February 16th, 1877.

In compliance with the request of the Secretary I have made inquiries as to the prevalence of the pleuro-pneumonia amongst cattle in this county during the year 1876.

You will see by the statement (herewith sent) furnished me by Dr. Wm. S. Vansant, veterinary surgeon, that there have been under his care nineteen affected herds, numbering two hundred and eighty heads, of which one hundred and forty-nine had the disease, and sixty-seven of them died, leaving one hundred and thirty-one that were not sick, whether on account of the preventives he administered, or because their systems were not susceptible to the disease, of course is not known.

You will observe that more than one-half of the whole number of these nineteen herds were sick, and nearly one-half of the sick died, so that about one-quarter of these herds were lost, besides the heavy expenses, losses and disadvantages otherwise consequent upon this plague.

And these were not all, as I am informed by Dr. Frank Hilliard (another veterinary surgeon of this place), and others, that several other herds have had similar experience, and both of these veterinarians inform me it is now on the increase, and with a virulence heretofore unknown in the winter season, as it generally subsides as cold weather approaches.

During the year 1875 there were only seven herds affected in this county.

Nearly all the cases can be traced to cattle that have come through the drove yards, or from other diseased herds, showing that it is

either infectious or contagious, or both, and often remains in the system for months before development.

What is the best remedy or course to pursue for its extirpation is now a very difficult question to answer.

If farmers would avoid cattle that have passed through the drove yards of the large cities, and the cars that are used for transporting cattle, it would prevent new out-breaks of the disease, which of course would necessitate the raising of their own stock, and if this were properly managed a much needed improvement might be made in the milch cows, as not more than one third of those now in this county are worth keeping for milking purposes.

And as the milk and butter business, especially the former, near the large cities, is a great and growing interest, and necessarily will continue to be, it cannot be too urgently recommended that dairy-men make such selections in their breeding stock of cattle as to obtain the best milkers, as to quantity and quality of milk. I am corroborated by many farmers with whom I have conversed upon the subject, that the generality of milch cows in this county now, as well as some other parts of the State, are far inferior to what they were a quarter and a third of a century ago, which reflects very unfavorably upon us in this age of improvement.

Trusting this will be remedied by the raising of our own stock, and thereby prevent the further introduction of the cattle disease,

I remain, yours truly,

JAMES LIPPINCOTT.

STATEMENT OF LOSSES BY LUNG PLAGUE IN CATTLE IN BURLINGTON COUNTY, BY WM. S. VANSANT, VETERINARY SURGEON.

Herds affected.	No. treated as a preventive.	No. sick, received special treatment.	No. died 1876.
1	12	12	6
2 .....	...	25	12
3	11	9	4
4	10	6	4
5	4	4	2
6 .....	...	1	...
7	6	10	6
8	10	2	...
9	9	16	8
10	6	10	5
11	10	10	4
12	8	12	6
13	13	5	1
14	2	4	2
15	7	5	1
16	4	4	1
17	3	3	1
18	6	5	3
19	10	6	1
	<hr/> 131	<hr/> 149	<hr/> 67

The disease is on the increase.

ANNUAL REPORT

OF THE

NEW JERSEY STATE HORTICULTURAL SOCIETY.

The second annual meeting of this society was held in Geological Hall, New Brunswick, N. J., on the first and second of February, 1877, with a large attendance.

Mr. B. B. Hance, from the Fruit Committee, reported a vast amount of neglect and poor culture among farmers, about the State relative to their orchards; while ordinary crops were cultivated thoroughly and well fertilized, orchards were allowed to take care of themselves; pruning was almost wholly neglected, the fruit, of course partaking of this neglect, was indifferent and unsatisfactory, and the business pronounced a failure. He urged closer observation and increased attention to this most important branch of horticulture.

Mr. W. H. Goldsmith, from the Vegetable Committee, reported that owing to the intense drought throughout the State the past summer, it was one of the most disastrous seasons for vegetables known for many years; many crops, especially the important ones of cabbage and potatoes, having been almost entire failures.

There has not been much of novelty brought to the notice of your committee. A variety of red top turnips, from Long Island we believe, has been noticed the past season, which, we think, is an improvement, and is so pronounced by the public, it having met a quick sale in our markets at one dollar and twenty-five cents and

one dollar and fifty cents per barrel, when nice ones of the old varieties were slow of sale at fifty cents. It is sweeter, more crisp and tender than the old kind, and retains its good qualities later in the season.

The different modes of putting up asparagus for market has been noticed, by your committee, to make a difference of one hundred per cent., and sometimes even more, in the returns for its sales. In the light soils of the southern part of this State and Delaware, where it is largely grown, it admits of being cut six to eight inches below the surface, and as the portion of the stalk below is much larger than that above ground, there is a gain in quantity in so cutting, but it is more than lost in quality; the part grown beneath the surface is not edible, and after one or two purchases customers reject it altogether, if other asparagus is to be had.

The Christiana musk melon, from what little has come to the notice of the committee, ought to be more generally known. The quality is almost invariably good, if well grown, and although not very inviting in outward appearance, it is desired by all who become acquainted with it. It appears to have been grown in the vicinity of Newark, N. J., for a number of years, but is as yet comparatively unknown even there.

The growing of lettuce, radishes, egg plants, &c., under glass, is a branch of gardening that is increasing very rapidly in the northern portion of the State, and owing to the lateness of the season in the spring of 1876, and the cutting off of some of the crops by frost in the south, it proved quite profitable. It is a business requiring much experience and careful and constant attention; a neglect of a few hours in the fluctuating weather that generally prevails at the time of year when operations in the business are most active, will destroy the labor of weeks, and sometimes the profits of the whole season. The labor of providing and distributing water for the growing crop is a heavy portion of the whole, and we see that windmills and tanks are coming into use for this purpose.

In conclusion, we call attention to the very fine specimen of squash on the table named *Excelsior*, a cross of the Boston Marrow and Custard, exhibited by Mr. D. C. Voorhees, of Blawenburg. It is represented as very superior for family use, fully equal to the famed Boston Marrow, and yielding abundantly, sometimes attaining a weight of one hundred pounds.

Mr. C. W. Idell, of Hudson, proposed a committee of one from each county to collect facts relating to the early history of small fruit culture in the State; after considerable discussion the matter was postponed till afternoon, when Mr. Idell gave his views more at length on the subject, and also some very interesting items he had gathered relating to the early history of cultivating and marketing the strawberry in this State.

The officers of last year, with two or three exceptions, were re-elected.

The annual address of the President, Prof. George Thurber, of Bergen county, contained many valuable hints and suggestions relative to the future action and labors of the society, and was listened to with marked attention by a large audience.

Mr. E. S. Carman, of Bergen county, read an interesting paper on Planting of Lawns and Door-yards. It abounded in hits at the incongruities and absurdities so frequently apparent in the so-called attempts at imitating Nature, and was replete with practical common sense suggestions of value to all who have work of this character to perform.

The subject of *Pear Blight* was discussed.

Mr. Quinn, of Newark, regarded it as the most important and interesting question that could be presented, especially to pear growers. It was insidious in its approaches, like a thief in the night. Had noticed orchards entirely destroyed. Flemish Beauty, Beurre Diel and Vicar of Winkfield seemed more liable to this scourge than any other.

Mr. Barnett, of Connecticut, asked if a case had been known on poor, sandy soil. He had some trees on such soil which were all right, he then manured a row of Vicars heavily, and lost them all.

Mr. G. W. Thompson, of Stelton, thought that was *just* the point, that excessive feeding and blight went hand in hand. He had heard of an oil remedy which had come so well authenticated, that he was inclined to think there was something in it.

Mr. J. Van Doren, of Monmouth, had tried it and thought then and thinks now he made a mistake. Had slit the bark, which he thought helped the tree.

Mr. Baird, of Monmouth, asked if Mr. Van Doren had removed the dead or diseased wood before applying the oil. He replied he had not.

Mr. E. Roberts, of Burlington, had used gas lime on a young orchard which so far had escaped the blight, but did not know as this was the preventive.

Mr. D. C. Voorhees, Somerset, thought it useless to prescribe a remedy for a disease we did not understand. His theory was, it was excessive growth and severe winters.

Mr. Tracy, of Philadelphia, said the subject was little understood, there was two distinct forms of this blight. The Pennsylvania Horticultural Society discussed this matter recently, and it was recommended to whitewash the trees.

Mr. J. S. Collins, of Burlington county, had blight on whitewashed trees, at least two seasons in succession.

Mr. G. W. Devoe, of Middlesex, found the Lawrence most exempt and thought drainage a preventive.

Mr. W. H. Goldsmith stated that with him the Lawrence was one of the worst to blight.

Ex-Governor Newell had one thousand and four hundred trees well cared for up to 1866, when the slug injured them very much. They leafed out so feebly the next year, he eradicated them and replaced them with Lawrence, Vicar and B. d'Anjou, and would recommend the latter as a good tree to set. Had allowed one orchard to stand in grass, and this, so far, was a success. He held the disease to be internal and radical and could not be remedied by cutting off the limbs.

Mr. E. W. Durand, of Essex, had made up his mind that excess of sap was conducive to the disease.

Mr. Barnett, of Connecticut, wished to correct the idea that sandy soil was a preventive. His theory was that excessive late growth and unripe wood when frost came, left unripe roots which winter killed, and a fungus spore developing at the root was absorbed in the sap in the hot, muggy days of June when the fungus began to grow between the bark and sapwood producing the blight.

Mr. E. Beekman, of Monmouth, cited a case where it went through an orchard diagonally from the southwest. The lines were well defined, and a locust tree in its track was also killed. He also knew an orchard of six acres of Vicar of Winkfield, on poor, sandy soil, for twelve years. The trees were stimulated with fish, and the following year were all destroyed by blight, and it looked as if it might be atmospheric.

Mr. B. B. Hance, of Monmouth, was pleased to hear so free an expression on this question, and asked how we were to reconcile the theories of extreme cold winters and undrained grounds. He knew an orchard set on low ground, so wet the water was bailed out of the holes before setting the trees, yet this orchard, now nearly twenty years old, is doing well, with less blight than contiguous ones on high, naturally dry soil. On the other hand, pear trees never did better than during the eight or ten years succeeding the severe winters of 1856-7.

Orcharding—is it overdone in our State regarding the apple or pear? was the next question, and was opened by Mr. Edwin Beekman, of Monmouth, who read a paper on the apple.

He said that in all orchards in Monmouth county, where extraordinary results have been obtained, there were three essential factors, viz: greensand marl as a fertilizer, encircling hills, and cultivation. As results of successful cultivation, one case was given where the sales from an orchard of sixteen acres, planted with the Orange, Nyack (or Summer) Pippins, and Pelican varieties, the sales amounted to six thousand dollars. Another orchard of Orange and Nyack Pippins and Sour Bough apples, returned in 1875 (the off year), five thousand dollars. To accomplish pecuniary results like these, early varieties only must be set, as these command much better prices in New York markets than later sorts. Nearness to market, and facilities for transportation, enabled farmers in his county to raise the more perishable kinds, and market them ahead of North river growers. Their apples were of a better quality also than those of the more Southern States. The varieties that have done best are in order, as follows, viz: Red Astrachan, Sour Bough (selected), Orange Pippin, Gravenstein and Keswick Codling.

Early varieties have another advantage over the late sorts; the fruit being gathered early in the season, the tree has time to make new spurs for the crop of the ensuing year, while with late apples it takes one year to make a crop, and another to form new wood and prepare for the next crop. The late Baldwin bears every other year, while the early Red Astrachan will bear some every year. The Orange Pippin also bears the *off* year, and has paid very well. Late varieties are, from this cause, no longer profitable in our county. And except for domestic use and for cider, the late crops will not foot up very heavy sales.

One worst drawback at present is the borer. The blight is disappearing, and from present indications will soon cease. The codling moth is increasing, and some of the old varieties are about worthless from the worms of this insect.

In the discussion following Mr. B. B. Hance stated that an extensive apple grower in Monmouth county, who had formerly worked up his refuse apples into cider, vinegar and whiskey, now admitted he found it more profitable to feed them to the hogs.

Mr. W. Parry, of Burlington, thought apple culture was not overdone in New Jersey by any means. She made but a poor show at the Centennial. Notwithstanding the advantages we possess we appeared far behind other States in apple growing.

Mr. Barnett, of Connecticut, saw at the Centennial evaporated apple juice in sheets, which put in water would dissolve and make cider.

Mr. Beekman claimed that the West and South had advantages of timber belts, the absence of which was the cause of our defective fruit. Early sorts paid the best. Considered the Orange Pippin one of the most profitable.

Mr. E. Roberts thought late apples were as profitable as early ones. The Orange Pippin was quite satisfactory, but they must be disposed of when ready—they would not wait on a market. With him Smith's Cider was one of the best and most profitable.

Mr. C. W. Idell said that some growers would find it more profitable if they would send less of their poor fruit to market. It was this that made prices average low.

The Secretary then gave the result of the vote on apples sent him by the members, naming the ten receiving the highest votes out of seventy-seven varieties. A motion to adopt these as the foundation of a list for general culture was, after some discussion, laid over till the next day, to which time the Society adjourned.

SECOND DAY'S SESSION.

The subject of apples was taken up, the report read and discussed, and with some additions adopted, viz. :

Baldwin,	Fall Pippin,
Maiden's Blush,	Smith's Cider,
Gravenstein,	R. I. Greening,
Porter,	Large Yellow Bough,
Red Astrachan,	Early Harvest,
Orange Pippin,	Roxbury Russett,
	Canfield.

The last named was added on the recommendation of members from Essex and Union.

The Duchess of Oldenburg, Baily Sweet, Hubbardston Nonesuch, Benoni, Peck's Pleasant, Summer Pippin, Fallawater, Moore's Sweet, Tetofsky, Nero and Dunker were adopted as a trial list.

The latter two are local varieties of Middlesex and Somerset counties, and highly commended.

Mr. Parry named Edward's Early as valuable in Burlington county.

Mr. W. N. Barnett, of Connecticut, then read a paper on Grape Culture, or Viticultural Education, at the conclusion of which he remarked that he had brought up this subject in view of its great importance to this State, where there are over five millions of acres within the vine zone, a million of which should be put in grapes. If each of the twenty-one counties in the State raised a crop of grapes and wine amounting only to one million dollars, which could easily be done on about three thousand acres, it would greatly exceed the present annual crop from all other productions.

Following this the Society resumed consideration of the fruit-list, and for grapes adopted the Concord, Delaware (for family use only), Hartford, Martha, Agawam and Salem, as the general list of grapes. And as a trial list, Wilder, Elsinburg, Early Amber, Barry, Lindly, Merrimack, Massasoit and Goethe.

The following resolution, by Mr. Parry, was adopted :

Resolved, That an invitation be extended to all fruit grows of the State to forward to the Corresponding Secretary of this Society, B.

B. Hance, of Red Bank, N. J., the date of the introduction of all *new* as well as old varieties of fruit known to them, and any items of interest connected with their propagation.

The pears then adopted for the general list were :

Bartlett,	Dayenne Boussock,
Sickel,	Beurre Clairgeau,
Duchesse d'Angouleme,	Buffum,
Lawrence,	Beurre Bose,
Beurre d'Anjou,	Beurre Giffard,
Clapp's Favorite,	Manning's Elizabeth.

The Sheldon was on the list with a vote of six for market and fifteen for family use, but owing to its sometimes cracking and shedding its leaves, it was placed on the trial list, which is as follows :

Sheldon,	Urbaniste,
Easter Beurre,	Dana's Hovey,
Howell,	Quinn,

Mt. Vernon.

The latter was said to be as good as Sheldon, of fine size, and keeps until the holidays.

The Vicar of Winkfield was thrown out altogether.

Mr. Goldsmith exhibited pear limbs affected with blight, showing various phases of the disease. In some instances a limb was shortened, it was supposed, below the diseased part, but it had extended down the limb and stopped, the limb below being perfectly healthy. Young shoots were shown partly blighted, while below the buds were sound and plump as ever; branches that were blighted in spots, and in one case a limb affected three years ago, was healing and new bark and wood was growing over the affected part. These seemed to disprove the idea advanced the day previous, that the disease was internal.

A special committee reported on the fruits and flowers exhibited, and urged the importance of more attention to this feature of our annual meeting.

The list of peaches, as compiled by the Secretary, from the votes received, was read and adopted as follows :

Crawford's Late,
Crawford's Early,
Large Early York,
Old Mixon,

Mountain Rose,
Honest John,
Stump the World,
Smock.

On motion of Mr. C. W. Idell, of Hoboken, the Morris's Late Bareripe, and of Mr. J. T. Lovett, of Red Bank, the Keyport White, were added to the list.

No trial list adopted.

The general list of plums adopted is :

White Magnum Bonum,	Richland,
Green Gage,	Damson.

Trial list is :

Wild Goose,	De Caradeuc,
Miner,	Bassett's American.

The general list of cherries adopted is :

Black Tartarian,	White Amber,
Black Eagle,	May Duke,
Rockport,	Coe's Transparent,
Early Richmond,	Biggareau,
	Gov. Wood.

Trial list :

Early Purple Guigne,	Luelling.
----------------------	-----------

The general list of raspberries adopted is :

Doolittle Black Cap,	Philadelphia,
Mammoth Cluster,	Brandywine.

The trial list is :

Winant,	Delaware,
Garrargua,	Early Prolific,
	Reliance.

The Winant highly commended by Mr. McLaury ; the last three by Mr. Parry.

Mr. Quinn advised caution in accepting statements regarding new fruits. We all remember the "Herstine," when introduced, was claimed to be *perfectly hardy*, and to possess all the requisite qualities of a first-rate market fruit ; and we now know how sadly disappointed we have been.

The Clarke, also, was claimed as perfectly hardy—a large, fine market variety. Time proves it to be neither hardy in winter or summer, and worthless for market.

The Philadelphia was also claimed to be large, luscious and firm; it proves to be neither, its chief merits being hardiness and productiveness.

The Secretary agreed with Mr. Quinn, and hoped this Society would discountenance any effort or tendency to commend anything beyond its merits.

The blackberries adopted for general culture are:

Kittatinny,	Wilson's Early,
Dorchester.	

The New Rochelle, or Lawton, was on the list, but was stricken out. The Snyder was named for trial.

Mr. Parry said its hardiness was its chief recommendation.

Hoosac Thornless was mentioned as being without thorns, and some one added—without fruit, too!

The strawberries adopted for general culture are:

Wilson,	Monarch of the West,
Chas. Downing,	Downer's Prolific.
Seth Boyden, (or Boyden's 30),	

The trial list is:

Durand's "Great American,"	Durand's "Beauty,"
Cumberland Triumph,	Duncan,
Sterling,	Prouty's Seedling.

Mr. McLaury, of Middlesex, enquired of the Secretary about the Duncan. From what he had been able to learn of it, he had strong hopes of its being a valuable market sort.

The Secretary, in reply, said the originator had heretofore had the market all to himself, his crop netting him thirty cents per quart annually. It had been planted largely and the coming season would witness the final test, and he had no reason to doubt Mr. McLaury's hopes would be fully realized.

The gooseberries adopted for general culture are:

Houghton,	Downing,
Mountain,	Smith's.

The currants adopted for general culture are :

Cherry,	Red Dutch,
Versailles,	White Grape,
	Black Maples.

The long bunched Holland for trial.

The quinces adopted for general culture are :

Apple or Orange,	Rea's Seedling.
------------------	-----------------

This completes the fruit list. It is not claimed to be perfect, but will be subject to revision at each annual meeting.

Insects Injurious to Fruits and Vegetables were next discussed, but no new facts were elicited.

Mr. Beekman said the apple borer was very destructive to apple trees and slugs to pear trees.

Mr. Goldsmith said there were two kinds of apple borers, one operating near the ground, the other works under the bark of the apple, pear and quince, three to four feet above ground, in the sunshine. They will not work in the shade.

Dry dust, lime or ashes thrown on the tree is a simple and effectual remedy for the slug.

The Secretary alluded to a sort of scale or fungus affecting the canes of Black Cap Raspberries ; its effect was enfeeblement and death.

Mr. Durand called attention to a grub that was very injurious to strawberry plants, living on the roots. It was similar in appearance to the one found in manure heaps, but more slender ; nearly the same size, but never so stout and bulky. They had troubled him seriously. Had tried all the remedies he could devise to destroy them, without effect.

Fertilizers were then discussed.

Mr. McLaury had used Manhattan blood fertilizer with good satisfaction. Poudrette was also good.

The Secretary had used fish scrap with very visible effects.

Mr. Goldsmith had used ashes with the best results on strawberries, not only as a fertilizer but mechanically, as it makes the soil lighter and prevents heaving.

Mr. Durand disapproved of horse manure on light soils for strawberries, as they were made still lighter; the strawberry required a close, compact soil. Muck was valuable on heavy clay, and he had found uncombined ammonia detrimental in all cases, and appealed to Prof. Cook to know if ammonia was really as valuable a constituent in fertilizers as formerly supposed.

Prof. Cook thought this a most important question. Fish might be quite as stimulating to the crop in appearance the first year, but not as permanent as bone.

The comparative benefits of ammonia and phosphoric acid in fertilizers is an unsettled question. There are very wide differences of opinion in regard to it among our highest authorities. These differences are owing partly to the difference in soils to be enriched, and partly to the crops upon which these fertilizers are applied.

Mr. J. B. Lawes, one of the most painstaking, persevering and successful experimenters with fertilizers, who has written upon the subject, gives the important place to ammonia, as the one from which his experiments prove he has derived the most benefit. But his farm is upon the English chalk, and there is an abundance of phosphates naturally in the soil, so that he really needs ammonia only to produce good crops. Such, however, is not the case upon soils of a different composition. In the English fen country where vegetable matter is abundant in the soil, superphosphate is the only commercial fertilizer that is considered to be of use.

In the vicinity of New Brunswick there appears to have been much better and more lasting results from the use of bone dust and superphosphates than from manures, which were chiefly ammoniacal; that is, for the raising of staple crops—grain, corn and hay.

In the case of green crops and vegetables, which are sold fresh in market, ammoniacal manures are decidedly beneficial and profitable, but the permanent improvement of the soil and its greater general productiveness is owing mostly to phosphatic manures. The uncertainty in regard to the effects of different fertilizers is gradually diminishing. It has been, rather unfairly, all laid to the frauds of manufacturers of fertilizers, when in fact there is probably as much blame to be attached to those who use them. As fast as those who buy fertilizers learn what they need for their own soils and crops, so fast will the manufacturers prepare themselves to supply their demands. This knowledge has to be acquired by careful and judi-

cious observations and experiments upon the different classes of our soils.

Mr. Van Doren spoke of the value of experimental stations as existing in Connecticut, by which half a million of dollars had been saved yearly to the farmers of that State.

Prof. Cook said a bill to authorize a similar establishment in this State was introduced into our Legislature last winter, but it was not passed.

New Brunswick was again selected as the place for the next annual meeting of the Society, and this most interesting session adjourned, subject to the call of the Executive Committee.

THE NEW JERSEY CRANBERRY GROWERS' ASSOCIATION.

ANNUAL MEETING.

The New Jersey Cranberry Growers' Association met in Trenton, on Tuesday, January 16th, Rev. Dr. Brakeley presiding. After reading of the minutes by Secretary Rider, which were approved, President Brakeley read the following

ADDRESS.

At this our first meeting in the new century of our Republic, it will not seem out of place, I trust, for me to present a concise view of the present status of the cranberry interest in our country. This interest, like many other important ones, has been mainly the product of the last quarter of a century, just now closed, and the person who first called attention to the cultivation of this fruit in New Jersey, by giving a practical illustration of its value, still lives to enjoy the fruit of his foresight and labor. Many a curious visitor, anxious to see the oldest cranberry bog in our State, calls at the unpretending dwelling of the now venerable John Webb, who continues to reside at his old place some two miles east of Cassville, in Ocean county. In commencing its cultivation, bountiful nature seems to have given him the hint. Some sand had been washed upon some vines, which he observed produced larger and more abundant fruit than others near by not thus favored. The hint was taken. Wild vines were gathered and planted in the sand where it had washed on the peat, more of the wild bog was ditched, sanded and planted, until it expanded into a respectable cranberry planta-

tion. A modest beginning truly, of an interest which now consists of more than five thousand acres, costing, when ready to fruit, little less than two millions dollars, and yielding annually about thirteen per cent. on the investment.

An average crop of cranberries in New Jersey may be set down at about one hundred thousand bushels. The Eastern States with New York yield about the same, while an ordinary crop of Wisconsin and Michigan may be rated at about seventy-five thousand bushels. This makes the annual yield of this fruit in our whole country two hundred and seventy-five thousand bushels. This quantity has hitherto proved ample for our forty millions of people, and left enough for the very modest wants of Paris, London and Liverpool

Many careful observers are engaged in cranberry culture, and much has been learned of the requirements necessary for eminent success. And yet there is still very much to learn. It is now settled beyond a doubt that it is necessary to flow a bog during winter, putting the water on in November and drawing it off from the first of April to the tenth of May. My own preference is to take it off the first of May. Others prefer earlier, and a few later.

The question whether, in forming a bog, peat bottom or savannah land is to be preferred is pretty well settled. Each has been found to possess its peculiar advantages and disadvantages. The special advantages of peat bottom are rapid and profuse growth of vine, and consequently an early and profuse bearing of fruit. The disadvantages are greater expense in preparing the ground, a liability to have the bloom killed by frost from the last of May to the twentieth of June, which frequently occurs, and the vines becoming excessively rank and woody, in eight or ten years die out in the ranker portions. The advantages of savannah land are moderate cost of planting, little if any liability to be injured by late spring frosts, and consequently greater certainty of a crop. The disadvantage, a sparser growth of vines, and consequently a smaller crop. Such being the case, it is well, where possible, to have a plantation made up of both kinds of land.

Formerly it was supposed that, in order to make a productive bog, it was necessary to have pure, coarse, white sand with which to cover the peat. Experience has demonstrated that this is not a necessary condition to eminent success. The most successful small bog with

which I am acquainted, producing annually a large crop of fine fruit, was covered with fine yellow sand mixed with a large portion of loam.

Thorough drainage also has been considered absolutely necessary. In taking the vines from the swamps, and planting them in land cleared up, turfed and sanded, they are placed in a new condition, and seem to require much less water than when in their normal state in undrained swamps. Indeed, they will not grow unless the land is comparatively dry. Besides, if the ground is wet, rushes and cut grass are very liable to take possession of the ground and crowd out the vines. But when the vines have full possession of the ground, my impression is that you cannot have it too wet for their healthy growth and fruitage. A certain amount of drainage must still be kept up, in order to carry off the surplus water after heavy rains, and also to prevent the growth of rushes, but beyond this the ditches may be suffered to fill up. Most of our best bogs have suffered from too much drainage. The bog above referred to as being eminently successful is the worst drained bog I ever saw.

Young bogs often suffer from too much weeding, and having this done at improper times. There are two or three rushes which grow in clumps, the two species of dewberry vines and two or three carices, which should be carefully removed as soon as they make their appearance in a bog. Also, any foreign growth, such as young maples, willows, briars, &c., should at once be removed. But there is a host of annuals which do more good than harm among the young vines, provided that they are not flowed for the first two or three years. By partially shading the ground, they favor a healthy growth of vines, and entirely disappear as the vines are prepared to take full possession.

I do not think it advisable to flow a young bog until the third year after planting, unless it be necessary to destroy the vine worm. While water fertilizes the vines and causes a more rapid growth, it also causes two or three of the annual grasses to grow with great profusion, so as frequently to smother and greatly retard the growth of vines on large portions of a bog.

The habits of the insect enemies of the cranberry have been carefully studied, and methods for checking or entirely preventing their ravages have been ascertained. The most formidable of these is the vine worm or fire worm, which is the larva of the moth known to

entomologists as the *Tortrix vaccinivorani*, an insect not rarely found in our sphagnous swamps and pine woods, before the cranberry vine was cultivated, feeding there on the different species of the whortleberry, as well as on cranberry vines. But since cultivated bogs have been formed, they have found a much more inviting field than our swamps presented, and have multiplied immensely, appearing at times in countless millions. Three broods of the larvæ make their appearance during the season, from the middle to the latter part of the months of May, July and September, respectively. The first brood, being the product of the moths which wintered over, is small, and consequently escapes the notice of all except the careful observer. The third brood, also, for some reason or other, is usually small. It is the second brood, which appears towards the latter part of July in such numbers as to eat every green leaf, as well as the young fruit, on a bog in which they have a lodgement. Feeding only on the under surface of the leaf, the upper dies and gives to the vines the appearance of having been burned over; hence one of its names, the fire worm.

Water is an effectual preventive. Remove all the hiding places for the moths, where they may pass the winter; also, cut away all whortleberry bushes for a distance of five or six rods from the bog, then cover it entirely with water, and let it remain on until the first of May, and there can be no possible danger from this pest.

The berry worm often does considerable harm, especially in dry seasons. The same remedy which is effectual for the destruction of the vine worm serves as a preventive for the berry worm. Well flowed bogs never suffer seriously from them.

For grasshoppers I still recommend turkeys and guinea fowls. While it seems impossible thoroughly to exterminate these destroyers, on plantations of moderate size, they may be held in check by a good flock of turkeys.

Last season a large caterpillar attacked the Eaglewood and Stafford Forge bogs, which, from the description I have received I suppose to have been a *Dryocampa*, a relative of the oak caterpillar which some seasons are so abundant in our forests. Ten years ago this same larvæ attacked a portion of the Park Cranberry Association's lands near Cookstown, but did not return the second season. Three years since they did much harm on the Oakwood plantation,

in the same neighborhood, but disappeared with the season. So I infer that that this is not a formidable enemy.

Last spring I heard from two plantations, about twelve miles apart, that the tip worm or bud worm had made its appearance. But after a careful inquiry, I was fully satisfied that this formidable enemy, well known and much dreaded on Cape Cod, had not made its appearance among us, and that the work attributed to it was the result of a late frost.

The absorbing problem of the present time is how to prevent the rot, which of late years has made such sad ravages. Some progress has been made in unraveling this mystery. Careful observation by the microscopist of our National Government has shown that it is not produced by a fungus, as is the case in the grape rot. It has also been shown that in many cases at least, it is produced by the diseased roots of the plants, this diseased condition being caused by the undecomposed peat in which they grow. This point, I believe, has been satisfactorily established. But the work of finding an explanation which will apply alike to peat bottom and savannah land, and the discovery of an effective remedy, are purposes yet to be effected. Much careful observation has been and still is being made, and it is to be hoped that this formidable obstacle in the way of successful cranberry culture will ere long be removed.

The very large returns received from a few fortunate investments in cranberry lands a few years since, caused many to rush into the business without duly considering the conditions necessary to success. At that time the fortunate possessor of a few acres of cranberry land was looked upon as on the high road to large wealth. As a natural result, large sums of money were lavishly squandered on tracts which never have made and never will make adequate returns. Many such tracts are now being abandoned and are going to waste.

At the present time it seems next to impossible to select with certainty a piece of land that will make a successful cranberry bog. A particular natural bog may possess all the conditions heretofore considered necessary to rapid growth of vines and ample fruitage, and yet when completed result in an entire failure. Indeed, our more experienced cranberry growers have become very cautious in giving an opinion in regard to the suitability of any particular tract. More knowledge on the subject is needed, more careful

observation must be made, and in this way those conditions better understood which will lead to success.

Upon the whole, the cranberry interest has assumed a very satisfactory position. The reckless and unremunerative expansion of the business has ceased. The prices received for the fruit are fully remunerative where the investment has been judicious. The supply, notwithstanding the ravages of the rot, is about equal to the demand. Droughts, untimely frosts, and the unusual ravages of insects, may reduce the crop, as they do any other crop, and then when the general business of the country is prosperous, prices will rule high. On the other hand, when all the conditions are favorable and the crop abundant, especially in the face of a large apple crop, the prices of this fruit also must be comparatively low. After a careful survey of the subject, I think the judicious investor in cranberry lands, has every reason to be satisfied with his investment.

REPORT OF THE FOREIGN TRADE COMMITTEE.

E. W. Crane read the report of the Foreign Trade Committee, as follows :

As heretofore reported, the Fruit Growers' Trade Company of New Jersey, (headquarters 180 Reade street, N. Y.) having relieved the Foreign Trade Committee of the principal part of their duties, they have only to report the continued exertions of the company to introduce the cranberry abroad—both in its natural state, and prepared for use. As was anticipated at the outset, progress in this enterprise is necessarily slow, though prospects are encouraging, and ultimate success is confidently expected.

E. W. CRANE,
N. R. FRENCH,
A. J. RIDER,

Foreign Trade Committee.

TRENTON, N. J., January 16th, 1877.

STATISTICAL REPORT.

Mr. French, Statistician of the Association, then read the following statistical report :

The course of the cranberry trade this season strikingly illustrates

the mutability of human judgment, and the uncertainty of business calculations. It also suggests a query as to the value of the statistical exhibits which I have periodically made to this Association. I have not failed to frequently mention their incomplete and fragmentary character in respect to current production and the disposition of the crops.

In this way I have hoped that the facts and estimates presented might do more good than harm (for there is always danger from too much reliance upon partial and incomplete information), and that ultimately cranberry growers would devise and carry out a more complete, prompt and valuable system of statistics than has yet been executed by any class of producers. Such a system would curtail the opportunities for speculative or gambling enterprises, and promote good judgment and equity in the disposition of crops. But this has not, and I believe will not, be reached through the voluntary work of a single individual.

In my report at Philadelphia on the 5th of September last, I mentioned that "recent reports from all the principal cranberry centres represent the present crop to be less than the small one of last year." I also remarked that it may prove very easy, considering the abundant apple crop, to hold back so much of the light crop of cranberries, during the season of greatest demand, that the regular period of low prices will be again fulfilled next spring.

On the 15th of September, I issued over three hundred postal card inquiries to cranberry growers in New Jersey and New England, with conveniently arranged blanks, asking for statement of crop of 1875 and estimated crop of 1876. I received from New England fifty-one replies, and the footings show that these growers raised in 1875 twelve thousand seven hundred and sixty-seven bushels, and that the aggregate crop of these same parties for 1876, as estimated by them, was fourteen thousand one hundred and fifty-five bushels, or an increase of nearly eleven per cent. over the product of the previous year. But these responses were relatively much more numerous from the interior of Massachusetts and from Rhode Island than from the great cranberry section of Cape Cod. The few growers that did respond to my inquiries from the Cape, did not fail to assure me that, although their individual crops might happen to be better than the previous year, the general crop of that section was far less, scarcely exceeding half the crop of 1875. Dennis,

and some other important cranberry districts had next to nothing. The belief in a short crop on the Cape, much below the small crop of 1875, was, no doubt, general and sincere, and I am not yet prepared to say it was not near the truth.

From New Jersey I received forty-five responses, showing that the aggregate crop of these growers in 1875 was forty-four thousand four hundred and six bushels, and that their *estimated* crop of 1876 was twenty-seven thousand six hundred and seventy-three bushels, or a decrease from the crop of the same parties in 1865 of nearly thirty-eight per cent.

I have been able to have direct correspondence with only a few of the Western cranberry growers, and these are mostly located about Berlin, Wisconsin. Reports from these and from Western cranberry dealers, whose interest would prompt them not to underrate the the Western crop, indicated a smaller yield than the small crop of 1875. Later advices and the course of trade lead me to think the Western crop of 1876 more than equal to that of 1875.

The belief in a very short crop and in corresponding high prices took strong hold at the commencement, of some leading dealers, both in New York and Boston. One or more large crops were contracted on Cape Cod at twelve dollars per barrel. Cranberry growers naturally hoped for all that the movements or representations of these sanguine parties indicated, and I was constantly met in New Jersey with reports that New York dealers were encouraging the exportation of four dollars to four dollars and fifty cents per bushel.

So deeply were prominent New York dealers impressed with the idea of an extremely short crop on Cape Cod, that wagers were laid that the firm receiving most from that section would not get five hundred barrels. They have already received over four thousand barrels. On the 15th of September I wrote in the circular of my firm to cranberry growers, "fair but not high prices may reasonably be expected." On the 1st of October, at which point of time French & Co. have for several years issued an annual circular with estimates of crop and general aspects of the cranberry trade, the situation seemed so uncertain, and the earlier calculations so much at fault, that we feared we could give no valuable information, and refrained from issuing the circular.

The receipts of cranberries at New York from New Jersey by the

New Jersey Southern Railroad, from commencement of season to December 31, 1876, were thirty thousand seven hundred and eighty-one crates and six hundred and ninety-four barrels, say thirty-two thousand eight hundred and sixty-three bushels. For same time by Pennsylvania Railroad, six thousand three hundred and twenty-three crates and five hundred and eighty-two barrels, say eight thousand six hundred and sixty bushels.

The two firms that receive in New York the larger part of the cranberries sent there from New England, had received up to December 31, very nearly six thousand barrels, while all others may have received two thousand barrels, making in all say twenty-four thousand bushels.

A summary of receipts at New York, from commencement of season to December 31, from New Jersey and New England for last three years, shows as follows in bushels :

	1874.	1875.	1876.
New Jersey.....	51,074	65,561	41,532
New England.....	40,000	12,000	24,000
Totals.....	81,074	77,561	65,532

The receipts above set down for last two years from New Jersey, are below the actual amount by at least what has been brought over the New York and Long Branch Road, perhaps three thousand to four thousand bushels each year. It will be noticed that the receipts from New Jersey this season, are below those of same time last year in about the same proportion as the estimated falling off of crop, while in the face of the claim of a greatly diminished crop on Cape Cod, and of a general increase of eleven per centum as indicated by the fifty-one crop reports before mentioned, the receipts from New England have fully doubled. It seems very clear, therefore, that the Cape Cod crop has been greatly underrated, or that Boston has taken relatively very much less than heretofore, thus throwing a greatly increased proportion upon New York.

To carry forward crop estimates for the country, I insert the table of my last annual report corrected by making the New Jersey crop of 1875 one hundred and ten thousand instead of ninety thousand bushels, and adding thereto the best guess I can make of 1876. It will then read as follows—the figures representing bushels :

	1872.	1873.	1874.	1875.	1876.
Cape Cod and adjacent islands.....	20,000	80,000	70,000	50,000	40,000
Massachusetts, Rhode Island and Connecticut.....	20,000	25,000	35,000	25,000	25,000
New Jersey.....	100,000	110,000	90,000	110,000	90,000
Wisconsin, Minnesota, Indiana and Michigan	135,000	60,000	50,000	40,000	40,000
New York.....	.....	.....	5,000	5,000	3,000
Totals.....	275,000	275,000	250,000	230,000	198,000

This figuring makes the crop of 1876 thirty-two thousand bushels less than that of the previous year, and shows a continued diminution of the general yield.

The apple crop has been most bountiful throughout the country, and notwithstanding the unprecedented export of one hundred and seventy-five thousand barrels, prices have not averaged so low in New York for twenty years. It is sometimes remarked that apples do not take the place of cranberries. This I think is true only of the class whose wealth or habits lead them to pay no attention to table economies—a class always relatively small, and now much smaller than four years ago.

Economy has of late years been forced upon our people, and is now becoming contagiously fashionable—a fashion which, if it continues, will mitigate and prevent a world of misery in our country.

When a barrel of good apples costs less than half the price of a bushel of cranberries, the latter may be considered a luxury, and the crop must be short indeed, to sustain this relative position. The rosy expectations of four dollars per bushel or more for prime cranberries, were nipped in the bud. In place of this a start was made at three dollars and twenty-five cents, while apples were selling at one dollar and twenty-five cents to one dollar and fifty cents per barrel; but the advent of handsome Cape Cod cranberries selling at eight to nine dollars per barrel, soon cut off the odd quarter and limited the demand for crates at the even figures of three dollars for prime qualities.

The receipts from Cape Cod now seem to be nearly over, and the market must rely mainly upon New Jersey fruit. I think the stock in New York on the 1st of January was probably less than at the commencement of 1875—then estimated at twelve thousand bushels—but it is no doubt more than double the amount on hand at the commencement of 1876. An unpleasant proportion of the New Jersey stock now on the New York market, has been there, as it was two years ago, long enough to soften and settle so as to be unsalable, unless put through the process of separating and repacking. This will produce a very great shrinkage of the original amount of sound fruit, besides glutting the market with soft berries not fit for shipment and not wanted at home.

This leads me to remark that experience indicates the bad policy of accumulating large stocks of this fruit upon the market. It keeps much better in open crates as it comes from the bog, if well housed and cared for, than after being cleaned, packed and transported. Besides rents, labor and attention are much cheaper in the country than in the city. When packed for market it should be pushed along to the consumers as rapidly as possible. If it cannot be sold at satisfactory prices with promptness, then keep it at home until you are willing to accept current rates. When our Cape Cod friends send their cranberries to New York they mean business, and if one price cannot be obtained another is promptly accepted, and thus they have little stale fruit to force off at extreme low rates.

The circumstances and course of the cranberry trade this season, weather included, has been a very close counterpart of two years ago. It will be quite surprising if the parallel holds until the end, thus adding another year to the regular alternation of high and low prices in the spring, so long observed. At the risk of trespassing upon the province of others, but with the hope of strengthening their hands, I desire to say a word about packages.

It seems to me that an increased number of crates below the standard size have been on the market this season. Some who send small crates justify themselves on the ground of self defense, but say they would be very glad to have a law passed and enforced, requiring uniformity of size. I think people who are not a law unto themselves, but desire to be compelled to do right, should be gratified, and that this association should take immediate steps for legal recognition of its standard of measures and its legal enforcement.

Jan. 16, 1877.

N. R. FRENCH, 180 Reade st., N. Y.

Secretary Rider spoke of the destructive work of mice. In places where probably twenty-five bushels per acre the mice had made the fruit scarcely worth picking.

Dr. Brakeley said mice were very delicate in their taste, taking only the seeds of the berry. He should apply arsenic in corn meal in the spring, set about in boxes where the mice could feed. Mr. Rider had already gone so far in the work that he had the strychnine in his pocket. Mice had destroyed hundreds of bushels; it was an easy matter to gather up a peck of destroyed fruit in the space of a square rod. Mr. Rider had imported cats.

After voting to meet in New Egypt, in September, the association adjourned.

APPENDIX.

The following is a partial list of Agricultural and Horticultural Societies in the State:

THE NEW JERSEY STATE AGRICULTURAL SOCIETY.

ORGANIZED, 1855.

President—Hon. Amos Clark, Jr., Elizabeth.

Vice Presidents—J. V. D. Hoagland, Millstone; N. N. Halsted, Newark; N. S. Rue, Cream Ridge; John S. Irick, Vincentown; E. G. Brown, Elizabeth.

Recording Secretary—William M. Force, Newark.

Corresponding Secretary—P. T. Quinn, Newark.

Treasurer—Samuel Manning, Plainfield.

Executive Committee—Wm. A. Morrell, Phineas Jones, E. G. Brown, J. B. Kilburne, Wm. Shove.

Number of Members—350.

Capital invested in Fair Grounds, Buildings, &c., \$90,000.

Meetings of the Directors are held on the third Wednesday in June, October and January; annual meeting of the Society, on the third Wednesday in January.

Annual exhibition, at Waverly, Essex county, third week in September, which is very largely attended. An annual report of the meetings and the exhibition is published.

NEW JERSEY CRANBERRY GROWERS ASSOCIATION.

ORGANIZED APRIL 25, 1873.

President—Rev. Dr. John H. Brakeley, Bordentown.

Vice Presidents—James A. Fenwick, New Lisbon; Dr. E. S. Merriman, Bricksburg.

Secretary and Treasurer—A. J. Ryder, Trenton.

Executive Committee—Rev. Dr. J. H. Brakeley, Bordentown; A. J. Ryder, Trenton; E. W. Crane, Caldwell; N. R. French, 180 Reade street, N. Y.

Representative in State Board of Agriculture—E. W. Crane, Caldwell.

Statistician—N. R. French, 180 Reade street, N. Y.

Corresponding County Secretaries—Ocean county, Julius Foster, Bricksburg; Burlington county, Theodore Budd, Pemberton; Atlantic county, Robert J. Byrnes, Hamonton; Monmouth county, Samuel Conover, Freehold; Middlesex county, F. L. Buckelew, Jamesburg; Camden county, Job Braddock, Haddonfield; Cape May county, Thomas Beasley, Cape May Court House.

Number of Members—108.

The annual meetings are held at Trenton, third Wednesday in January; and annual conventions, first Tuesday in September, at such place as selected at the annual meeting.

NEW JERSEY STATE HORTICULTURAL SOCIETY.

ORGANIZED AUGUST 17, 1875.

President—George Thurber, Lodi, Bergen county, N. J. P. O. address 245 Broadway, New York.

Vice Presidents—A. S. Fuller, Ridgewood, Bergen county; J. S. Collins, Moorestown, Burlington county; George M. Cole, Deerfield, Cumberland county; J. C. Beardsley, Newark, Essex county; C. W. Idell, Hoboken, Hudson county; E. Allen, New Brunswick, Middlesex county; J. Van Deventer, Princeton, Mercer county; J. Van Doren, Manalapan, Monmouth county; B. T. Errington, Whiting, Ocean county; H. E. Chitty, Paterson, Passaic county; E. Dayton, Bernardsville, Somerset county; N. W. Purcell, Elizabeth, Union county.

Recording Secretary—E. Williams, Montclair, Essex county.

Corresponding Secretary—B. B. Hance, Red Bank, Monmouth county.

Treasurer—W. H. Goldsmith, Newark, Essex county.

Executive Committee—P. T. Quinn, Newark, Essex county; E. Roberts, Fellowship, Burlington county; S. C. De Cou, Moorestown, Burlington county; Thomas Cole, Deerfield, Cumberland county; D. McLaury, New Brunswick, Middlesex county.

Fruit Committee—B. B. Hance, Red Bank, Monmouth county; William Parry, Cinnaminson, Burlington county; D. McLaury, New Brunswick, Middlesex county; C. W. Idell, Hoboken, Hudson county; P. T. Quinn, Newark, Essex county.

Vegetable Committee—W. H. Goldsmith, Newark, Essex county; Henry Campbell, Freehold, Monmouth county; W. H. Denise, Freehold, Monmouth county.

Flower Committee—H. E. Chitty, Paterson, Passaic county; George Such, South Amboy, Middlesex county; E. S. Carman, River Edge, Bergen county.

This Society was organized and held its first meeting at New Brunswick, August, 1875. The annual meeting was held in the Geological Hall of Rutgers College, New Brunswick, January 20th, 1876. The second annual meeting was held at the same place, February 1st and 2d, 1877.

ATLANTIC COUNTY.

EGG HARBOR CITY AGRICULTURAL SOCIETY—ORGANIZED MARCH 23, 1859.

President—Philip Steigauf, Egg Harbor City.
Vice President—Adam Veit, Egg Harbor City.
Recording Secretary—Valentine P. Hoffman, Egg Harbor City.
Treasurer—William Bohns, Egg Harbor City.
Librarian—John H. Trannler.
Number of Members—76.

Meetings—First and third Fridays in each month, at the Union Hotel, Egg Harbor City.

Annual Fair—Latter part of September.

ATLANTIC COUNTY AGRICULTURAL ASSOCIATION—ORGANIZED 1874.

BAKERSVILLE AGRICULTURAL CLUB.

FRUIT GROWERS' UNION, HAMMONTON*—ORGANIZED 1868.

President—George F. Saxton, Hammonton.
Secretary—Gerry Valentine, Hammonton.
Other Officers—One Vice President and six Directors.
Number of Members—100.

BURLINGTON COUNTY.

BURLINGTON COUNTY AGRICULTURAL SOCIETY—ORGANIZED 1846.

President—Isaac Fenimore.
Vice President—Emmor Roberts.
Directors—Isaac Fenimore, Emmor Roberts, B. F. Deacon, Judson C. Gaskill, Wm. R. Hancock, Wm. S. Taylor, Joseph Wills, John B. Collins, Theodore H. Risdon.
Recording Secretary—John B. Collins, Mount Holly.
Corresponding Secretary—Henry I. Budd, Mount Holly.
Treasurer—Edward B. Jones, Mount Holly.
Delegate to the State Board of Agriculture—James Lippincott, Mount Holly.
Number of Members—(stockholders)—400.

*No report of officers and meetings received since last year's report.

Meetings—In the Burlington county Lyceum rooms, quarterly, viz.: on the fourth Saturday in January, April, July and October.

Annual Exhibitions—Generally the first Tuesday and Wednesday of October.

BURLINGTON COUNTY FARMERS' CLUB*—ORGANIZED IN 1871.

President—James Lippincott, Mount Holly.

Vice Presidents—Clayton Zelle, Joseph W. Emley, James Logan.

Secretary—Henry I. Budd, Mount Holly.

Treasurer—Edward L. Bowne.

Number of Members—80.

The meetings have been irregular on account of the absorption of members in the Granges, a list of which follows this list of Agricultural and Horticultural Societies.

MOUNT LAUREL FARMERS' CLUB OF BURLINGTON COUNTY—ORGANIZED DECEMBER, 1865.

President—William Dunn Rogers, Mount Laurel.

Recording Secretary—Chalkly Stokes, Mount Laurel.

Corresponding Secretary and Treasurer—Mark H. Busby, Masonville.

Meetings—First Monday in each month, in their own hall, at Mount Laurel.

Number of Members—110.

CAMDEN COUNTY.

FARMERS' MUTUAL BENEFIT ASSOCIATION—ORGANIZED JANUARY, 1872.

President—Joseph C. Hollingshead, Haddonfield.

Vice President—Ezra C. Bell.

Recording Secretary—Amos E. Kaighn.

Corresponding Secretary—Edward Burrough, Merchantville.

Treasurer and Librarian—J. Stokes Coles.

Number of Members—35.

Meetings are held regularly, on the last Thursday of each month.

* No report received since the last meeting.

CAPE MAY COUNTY.

CAPE MAY COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY*—ORGANIZED
MARCH, 1870.

President—George H. Dare, Seaville.

The annual meeting is held the last Saturday in February, and an exhibition in September.

CAPE MAY AGRICULTURAL SOCIETY*—ORGANIZED APRIL, 1870.

President—Dr. John Wiley, Cape May Court House.

Secretary—John Spaulding, Cape May Court House.

Treasurer—Coleman F. Leaming.

Number of Members—50.

Meetings are held in April and July, and an exhibition in September or October.

CUMBERLAND COUNTY.

CUMBERLAND COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED
DECEMBER 8, 1851.

President—Charles Woodnut, Shiloh.

Vice Presidents—John S. Holmes, Dr. Samuel G. Cattell, Joseph H. Ogden, Ephraim P. Ayres.

Secretary—Eli E. Rodgers, Bridgeton.

Treasurer—Francis Danzenbaker, Bridgeton.

Number of Members—518.

Annual Meeting—Fourth Wednesday in January.

Annual Exhibition in September. The society is in a prosperous condition.

VINELAND AGRICULTURAL SOCIETY†—ORGANIZED, OCTOBER, 1862.

President—S. D. Clark, Vineland.

Recording Secretary—Richard Lush, Vineland.

* No report of officers received since last meeting.

† No report of officers, meetings, etc., received since last annual report.

Corresponding Secretary— ——— ———.

Treasurer—Q. Wright, Vineland.

Librarian—William A. Jolly, Vineland.

Number of Members—75.

Meetings are held every Saturday evening; and an agricultural, horticultural and floricultural fair is held annually.

FLORAL SOCIETY, VINELAND*—ORGANIZED 1864-5.

President—Mrs. O. D. Graves, Vineland.

Vice President—Mrs. C. D. Bailey, Vineland.

Secretary—Mrs. L. D. Dyer, Vineland.

Treasurer—Mrs. W. P. Swasey, Vineland.

Number of Members—200.

Meetings weekly. The Society is strictly floral, but it unites with the Vineland Agricultural Society in their annual exhibition. A chrysanthemum show is held in the fall of each year.

SOUTHWEST VINELAND FARM AND GARDEN CLUB.

President— ——— ———.

Secretary—C. H. Lewis.

WEST VINELAND FARM AND GARDEN CLUB.

President— ——— ———.

Secretary—G. W. Lewis, Vineland.

GLOUCESTER COUNTY.

WOODBURY FARMERS' CLUB.*

President—Joseph Carter, Woodbury.

Vice President—Daniel J. Packer, Woodbury.

Secretary—Charles W. Knight, Woodbury.

Corresponding Secretary—D. Cooper Andrews, Woodbury.

Treasurer—James Budd, Woodbury.

Number of Members—30.

The meetings have been suspended for some time.

* No reports of officers, meetings, &c., received since last annual report.

UPPER GREENWICH FARMERS' CLUB.

President— ————

Secretary—Thomas D. Brown, Clarksboro'.

HUNTERDON COUNTY.

HUNTERDON COUNTY AGRICULTURAL SOCIETY*—ORGANIZED FEBRUARY 16, 1856.

President—John C. Hopewell, Flemington.

Vice Presidents—Caleb F. Fisher, George F. Crater.

Recording Secretary—John L. Jones, Flemington.

Corresponding Secretary—Richard S. Kuhl, Flemington.

Number of Members—350.

Meetings of stockholders are held on the third Saturday of February, and an exhibition on the Tuesday, Wednesday and Thursday of the last week in September.

UNION FARMERS' CLUB,* MOUNT AIRY.

President—Elisha E. Holcombe, Lambertville.

Vice President—Newton K. Young.

Secretary—F. S. Holcomb.

Treasurer—Gideon M. Brewer.

Number of Members—26.

MERCER COUNTY.

THE FARMERS' ASSOCIATION OF PRINCETON—ORGANIZED IN 1840.

President—Hon. James Vandeventer, Princeton.

Vice President—Hon. James H. Bruere, Princeton.

Secretary—Henry E. Hale, Princeton.

Number of Members—Limited to 20.

Meetings are held once a month, at the houses of the members.

*No reports of officers and meetings received since the publication of the last annual report of this Board.

HOPEWELL FARMERS' CLUB*—ORGANIZED DECEMBER 19, 1868.

President—Ralph Ege, Hopewell.
Vice President—Joseph M. Phillips, Hopewell.
Secretary—John M. Dalrymple, Hopewell.
Treasurer—William I. Phillips.
Number of Members—18.

Meetings are held on the first and third Wednesdays of each month.

MIDDLESEX COUNTY.

MIDDLESEX COUNTY FARMERS' CLUB—ORGANIZED NOVEMBER 12, 1867.

President—Jacob Christopher, New Brunswick.
Vice President—Adrian Vermeule, New Brunswick.
Recording Secretary—George H. Lambert, New Brunswick.
Treasurer—Dr. A. D. Newell, New Brunswick.
Number of Members—75.

Meetings are held the first Monday of each month.

MONMOUTH COUNTY.

MONMOUTH COUNTY AGRICULTURAL SOCIETY—ORGANIZED IN 1852.

President—Nathaniel S. Rue, Fillmore.
Vice Presidents—Daniel Conover, Marlborough ; Joseph H. Holmes, Holmdel.
Corresponding Secretary—John C. Smock, Freehold.
Recording Secretary—J. J. Conover, Freehold.
Treasurer—C. A. Bennett, Freehold.
Number of Members—300.

Meetings are held on the third Tuesday in January, and at the time of Exhibition, in September.

Annual Exhibition—Second week in September.

*No report of officers and meetings received this year.

MONMOUTH COUNTY FARMERS' CLUB*—ORGANIZED FEBRUARY 18, 1869.

President—John S. Whitlock, Matawan.
Vice President—Henry Schanck, Freehold.
Secretary—S. E. Thompson, Freehold.
Treasurer—John Dorrance, Freehold.
Number of Members—79.

Meetings are held at Freehold, on the first Tuesday in January, February, March, June, September and December.

MONMOUTH COUNTY POULTRY ASSOCIATION*—ORGANIZED IN 1873.

President—John Van Mater, Colts Neck.
Secretary—John T. Rossell, Freehold.
Treasurer—D. A. Vanderveer, Manalapan.

Meetings are held quarterly at Freehold, at which essays on poultry are read. An exhibition is held annually, at Freehold, either in December or January. These have attracted much attention, and have done much to improve the stock of poultry in the country. They are open to competitors from all parts of the world.

OCEAN COUNTY.

OCEAN COUNTY AGRICULTURAL SOCIETY.*

President—George Cowperthwaite, Toms River.
Secretary—J. W. Carmichael, Toms River.

SALEM COUNTY.WEST JERSEY AGRICULTURAL AND HORTICULTURAL ASSOCIATION OF THE COUNTIES
OF SALEM AND GLOUCESTER, NEW JERSEY.

President—Omar Borton, Woodstown.
Vice Presidents—John W. Dickinson, Woodstown; Robert Vanmeter, Elmer;
Dr. M. J. Paulding, Daretown; John Hanes, Woodstown.
Secretary—J. Morgan Barnes, Woodstown.
Treasurer—Dr. L. A. D. Allen, Woodstown.
Number of Members—264.

*No report of officers, &c., received since the last meeting.

Meetings—The annual meeting is on the third Thursday in January, and a semi-annual meeting, third Thursday of July, at Woodstown.

The next annual exhibition will be held Sept., 1877.

SOMERSET COUNTY.

SOMERSET COUNTY FARMERS' AND MANUFACTURERS' ASSOCIATION—ORGANIZED JULY 16, 1870.

President—Rynier H. Veghte, Somerville.

Vice President—Abm. T. Huff.

Secretary—William S. Potter, Somerville.

Treasurer—L. R. Vredenburg, Somerville.

Number of Stockholders—About 600.

The annual meeting of the stockholders is held on the third Saturday of February. The annual fair of the Society is held in the first week in October.

UNION COUNTY.

UNION COUNTY FARMERS' CLUB—ORGANIZED DECEMBER 11, 1868.

President—Noah W. Parcell, Union.

Vice President—E. P. Beebe, Elizabeth.

Secretary—Dennis C. Crane, Roselle.

Treasurer—Ogden Woodruff, Elizabeth.

Number of Members—35.

Meetings are held in the Court House, Elizabeth, semi-monthly, excepting in the summer. They are informal in character, and the discussions relate to general farm questions. Agricultural papers are taken, and the club has a library.

WARREN COUNTY.

WARREN COUNTY FARMERS', MECHANICS' AND MANUFACTURERS' ASSOCIATION*—
ORGANIZED 1859.

President—John V. Deshong, Belvidere.

Secretary—J. T. Kern, Belvidere.

Treasurer—Israel Harris, Belvidere.

Number of Members—60.

The annual meeting is held at Belvidere, the last Friday in December. The annual exhibition takes place at Belvidere on the first Tuesday in October.

The interest in our Agricultural Societies and Farmers' Clubs has, to a considerable extent, been transferred to the Farmers' Granges, which have been organized in many parts of the State. The following list of Granges and officers has been sent to the Board by Mortimer Whitehead, Esq., of Middlebush, Somerset county.

* No report received this year.

NOTE.—There are a few names of persons in the marl district which have not been corrected, up to the present time, for lack of needed information, but it is hoped there are very few which are wrong.

OFFICERS

OF THE

NEW JERSEY STATE GRANGE, P. OF H.

1877.

Master.....	WM. S. TAYLOR.....	Burlington, Burlington county.
Overseer.	CHALKLEY DUELL.....	Wenonah, Gloucester county.
Lecturer	MORTIMER WHITEHEAD..	Middlebush, Somerset county.
Steward.....	GEO. W. JESSUP	Cinnaminson, Burlington county.
Assistant Steward..	GEO. H. GAUNT.....	Paulsboro, Gloucester county.
Chaplain	Rev. EDWARD WILSON	New Brunswick, Middlesex co.
Treasurer	CHALKLEY A. RULON.....	Swedesboro, Gloucester county.
Secretary	WILLIAM C. KATES.....	Woodstown, Salem county.
Gate Keeper.....	ELISHA E. HOLCOMBE..	Lambertville, Hunterdon county.
Ceres.....	Mrs. JULIA K. TAYLOR...	Burlington, Burlington county.
Pomona.....	Mrs. MARY G. DUELL.....	Wenonah, Gloucester county.
Flora	Mrs. ETTIE A. JESSUP.....	Cinnaminson, Burlington county.
Lady Ass't Steward..	Mrs. HANNAH C. HOLCOMBE....	Lambertville, Hunterdon county.

EXECUTIVE COMMITTEE.

WM. S. TAYLOR.....	Burlington, Burlington county.
MORTIMER WHITEHEAD.....	Middlebush, Somerset county.
WM. R. HANCOCK.....	Columbus, Burlington county.
GILBERT H. VANMATER.....	Holmdel, Monmouth county.
MORRIS BACON.....	Greenwich, Cumberland county.

LIST OF SUBORDINATE GRANGES, P. OF H.

NO.	NAME OF GRANGE.	MASTER.	P. O. ADDRESS.	SECRETARY.	P. O. ADDRESS.
1	Pioneer.....	Samuel Blish ..	New Brunswick, Middlesex co.....	William W. Henderson.....	New Brunswick, Middlesex co.....
2	Marl Ridge.....	B. A. Martin.....	New Egypt, Ocean co.....	F. S. Gaskill.....	New Egypt, Ocean co.....
3	Hammoncton.....	R. J. Byrnes.....	Hammoncton, Atlantic co.....	E. J. Woolley.....	Hammoncton, Atlantic co.....
5	Swedesboro.....	Joseph Heritage.....	Swedesboro, Gloucester co.....	D. W. Sithens.....	Swedesboro, Gloucester co.....
6	Mount Laurel.....	Edmund I. arnell.....	Mount Laurel, Burlington co.....	J. B. Joyce.....	Moorestown, Burlington co.....
7	Somerset.....	Joseph Waker.....	Middlebush, Somerset co.....	John S. Bennett.....	Middlebush, Somerset co.....
8	Moorestown.....	Levi Ballinger.....	Box 44, Moorestown, Burlington co.....	Sallie M. Ballinger.....	Box 44, Moorestown, Burlington co.....
9	Woodstown.....	Richman Coles.....	Harrisonville, Gloucester co.....	Edwin C. Borton.....	Woodstown, Salem co.....
10	Paulsboro.....	Isaac J. Cowgill.....	Paulsboro, Gloucester co.....	Edward G. Miller.....	Paulsboro, Gloucester co.....
11	Vineland.....	Frank Van Valin.....	Vineland, Cumberland co.....	Susan P. Fowler.....	Vineland, Cumberland co.....
12	Kingsess.....	E. E. Holcombe.....	Lumbertville, Hunterdon co.....	D. V. L. Schenck.....	Lumbertville, Hunterdon co.....
13	Kohansey.....	Charles Hunt.....	Bridgeton, Cumberland co.....	Eli E. Rogers.....	Bridgeton, Cumberland co.....
14	Edgewood.....	John L. Deacon.....	Burlington, Burlington co.....	Robert H. Fort.....	Burlington, Burlington co.....
15	Newfield.....	E. O. Lee.....	Newfield, Gloucester co.....	A. W. Page.....	Newfield, Gloucester co.....
16	Hopewell.....	A. R. Jones.....	Shiloh, Cumberland co.....	J. C. Bowen.....	Shiloh, Cumberland co.....
17	Harmony.....	Reece Hurff.....	Cohansey, Cumberland co.....	George W. Moore.....	Box 530, Bridgeton, Cumberland co.....
18	Cumberland.....	Morris Bacon.....	Greenwich, Cumberland co.....	Josiah Bacon.....	Greenwich, Cumberland co.....
19	Progress.....	Benjamin Urnes.....	Elizabeth, Union co.....	Thomas B. Kingsland.....	Roselle, Union co.....
20	Fenwick.....	W. B. Ridgway.....	Hancock's Bridge, Salem co.....	W. W. Patrick.....	Hancock's Bridge, Salem co.....
21	Seaville.....	George M. Post.....	South Seaville, Cape May co.....	William Doolittle.....	Oceanview, Cape May co.....
22	Harlingen.....	J. G. Cortelyou.....	Plainville, Somerset co.....	A. S. Hageman.....	Harlingen, Somerset co.....
23	Frankford.....	Zachariah H. Price.....	Papakating, Sussex co.....	John P. Wyker.....	Branchville, Sussex co.....
24	Union.....	Asa P. Horner.....	Palmyra, Burlington co.....	Joseph M. Kaighn.....	Camden, Camden co.....
25	Mannington.....	Woodnutt Pettit.....	Salem, Salem co.....	Cleatin Wistar.....	Salem, Salem co.....
26	Harrisonville.....	Asa Lippincott.....	Harisonville, Gloucester co.....	Charles K. Horner.....	Harrisonville, Gloucester co.....
27	Elisiboro.....	Samuel Towell.....	Salem, Salem co.....	Richard M. Acton, Jr.....	Salem, Salem co.....
28	Stoe Creek.....	Charles S. Tyler.....	Greenwich, Cumberland co.....	Ephraim Mulford.....	Roadstown, Cumberland co.....
29	Pittsgrove.....	Adam S. Graf.....	Pittsgrove, Salem co.....	George M. Graf.....	Pittsgrove, Salem co.....
30	Franklin.....	John Garrison.....	Daretown, Salem co.....	E. Garrison.....	Daretown, Salem co.....
31	Alloway.....	John M. Kerlin.....	Allowaystown, Salem co.....	Lewis M. James.....	Allowaystown, Salem co.....
32	Bridgetport.....	Samuel Black.....	Bridgetport, Gloucester co.....	Charles G. Burk.....	Bridgetport, Gloucester co.....
33	Lafayette.....	Sylvester Slater.....	Lafayette, Sussex co.....	Raymond Snyder.....	Lafayette, Sussex co.....
34	Cedarville.....	H. F. B. Husted.....	Fairton, Cumberland co.....	John Rainer.....	Fairton, Cumberland co.....
35	Quinton.....	Robert Griscom.....	Quinton, Salem co.....	R. M. DuBois.....	Salem, Salem co.....
36	Medford.....	Albert Haines.....	Medford, Burlington co.....	Isaac Nicholson.....	Medford, Burlington co.....
37	Mount Holly.....	Henry Ellis.....	Julistown, Burlington co.....	Annie H. Deacon.....	Mount Holly, Burlington co.....
38	Haddon.....	Isaac W. Nicholson.....	Camden, Camden co.....	George T. Haines.....	Haddonfield, Camden co.....
39	Mantua.....	Chaklev Duell.....	Wenonah, Gloucester co.....	William C. Long.....	Mantua, Gloucester co.....
40	Lawrence.....	George W. Johnston.....	Trenton, Mercer co.....	Isaac B. Baker.....	Lawrence Station, Mercer co.....
41	Auburn.....	John M. Given.....	Auburn, Salem co.....	Edwin W. Lippincott.....	Auburn, Salem co.....
42	Penns Grove.....	J. Ford Thompson.....	Penns Grove, Salem co.....	Aaron Wright.....	Penns Grove, Salem co.....
43	Hope.....	E. S. Wallen.....	Bridgeton, Cumberland co.....	E. J. Cook.....	Bridgeton, Cumberland co.....
44	Branchburg.....	J. B. D. Myers.....	Readington, Hunterdon co.....	William Nosseller.....	North Branch Depot, Hunterdon co.....
46	Pedricktown.....	Benjamin F. Staughen.....	Pedricktown, Salem co.....	Charles C. Barber.....	Pedricktown, Salem co.....
47	Hamburgh.....	W. H. Edsal.....	Hamburgh, Sussex co.....	John P. Wilson.....	Hamburgh, Sussex co.....
49	Rancocas.....	George W. Wolf.....	Rancocas, Burlington co.....	Joseph E. Bishop.....	Rancocas, Burlington co.....
50	Pemberton.....	Theodore Budd.....	Pemberton, Burlington co.....	H. R. Lippincott.....	Pemberton, Burlington co.....
51	Mullica Hill.....	Frank Iszard.....	Mullica Hill, Gloucester co.....	J. C. Hazelton.....	Mullica Hill, Gloucester co.....

52	Deerfield.....	Joseph D. Coles.....	Deerfield, Cumberland co.....	Charles D. Moore.....	Deerfield, Cumberland co.....
53	Pleasant Grove.....	John S. Woodruff.....	Box 622, Bridgeton, Cumberland co.....	H. K. Adcock.....	Palatine, Salem co.....
54	Palatine.....	R. M. Hitchner.....	Elmer, Salem co.....	Thomas Murphy.....	Mauritown, Cumberland co.....
55	Mutual.....	Joseph Shropshire.....	Mauritown, Cumberland co.....	Robert Shropshire.....	Readington, Hunterdon co.....
56	Readington.....	J. T. Cox.....	Readington, Hunterdon co.....	Andrew A. Thompson.....	Readington, Hunterdon co.....
57	Centre Grove.....	Daniel E. Earl.....	Millville, Cumberland co.....	Michael S. Everingham.....	Millville, Cumberland co.....
58	Columbus.....	Franklin S. Zelle.....	Jacksonville, Burlington co.....	Alfred Troth.....	Georgetown, Burlington co.....
59	Woodbury.....	Edward J. Lodge.....	Woodbury, Gloucester co.....	James T. Budd.....	Woodbury, Gloucester co.....
60	Courses' Landing.....	Nathan R. Steward.....	Sharptown, Salem co.....	Mrs. Annie H. Steward.....	Sharptown, Salem co.....
61	Crosswicks.....	Howard Middleton.....	Crosswicks, Burlington co.....	Thomas F. Applegate.....	Crosswicks, Burlington co.....
62	Concord.....	E. B. Clouse.....	Franklinville, Gloucester co.....	Mrs. E. B. Clouse.....	Franklinville, Gloucester co.....
63	Five Points.....	J. S. Rulon.....	Five Points, Gloucester co.....	F. H. Heritage.....	Five Points, Gloucester co.....
64	Pennington.....	Joseph B. Horn.....	Pennington, Mercer co.....	N. M. Lewis.....	Pennington, Mercer co.....
66	Millville.....	James Leatherwood.....	South Vineland, Cumberland co.....	A. E. Burcham.....	Millville, Cumberland co.....
69	Glassboro.....	Wm. S. Kerns.....	Glassboro, Gloucester co.....	S. H. Stranger, Jr.....	Glassboro, Gloucester co.....
70	Newport.....	Solon H. Chambers.....	Newport, Cumberland co.....	Charles S. Husted.....	Newport, Cumberland co.....
71	South Branch.....	Stephen Weaver.....	South Branch, Somerset co.....	Abraham Beekman.....	South Branch, Somerset co.....
72	Sandyston.....	Elias H. Roe.....	Bevans, Somerset co.....	John Youngs.....	Bevans, Somerset co.....
73	Ewing.....	Henry Krewson.....	Greensburg, Mercer co.....	Charles H. Walker.....	Greensburg, Mercer co.....
74	Mount Pleasant.....	S. D. Warriner.....	Forest Grove, Gloucester co.....	Mrs. A. E. Porter.....	Forest Grove, Gloucester co.....
75	Forest Grove.....	Jacob Bloom.....	Little York, Hunterdon co.....	Josiah Clark.....	Milford, Hunterdon co.....
76	Milford.....	W. A. Weart.....	Stoutsburg, Somerset co.....	W. I. Phillips.....	Hopewell, Mercer co.....
77	Mercer.....	Abiah Wilson.....	Deckertown, Sussex co.....	Newman Hall.....	Deckertown, Sussex co.....
78	Wantage.....	J. C. Robbins.....	Hamilton Square, Mercer co.....	Azariah Cubberly.....	Hamilton Square, Mercer co.....
79	Hamilton.....	Geo. B. Stothoff.....	Flemington, Hunterdon co.....	Charles Watson.....	Flemington, Hunterdon co.....
80	Flemington.....	Charles R. Loveland.....	Colansey, Cumberland co.....	H. C. Perry.....	Allowaytown, Salem co.....
81	Friesburg.....	I. S. Rundle.....	Walpack Centre, Sussex co.....	John H. Wood.....	Walpack Centre, Sussex co.....
82	Walpack.....	Wm. M. Iliff.....	Andover, Sussex co.....	Theodore F. Young.....	Andover, Sussex co.....
83	Andover.....	Daniel L. Lamb.....	Turnerville, Gloucester co.....	John Wilkins.....	Turnerville, Gloucester co.....
84	Bethel.....	Thomas E. Craver.....	Williamstown, Gloucester co.....	John M. Taggart.....	Williamstown, Gloucester co.....
85	Williamstown.....	Enos G. Budd.....	Budd's Lake, Morris co.....	A. D. Budd.....	Budd's Lake, Morris co.....
86	Budd's Lake.....	C. W. Kilborn.....	South Vineland, Cumberland co.....	D. N. King.....	South Vineland, Cumberland co.....
87	South Vineland.....	H. F. Bodine.....	Locktown, Hunterdon co.....	A. W. Carrell.....	Locktown, Hunterdon co.....
88	Locktown.....	John W. Haines.....	Vincentown, Burlington co.....	J. B. Woolman.....	Vincentown, Burlington co.....
89	Fabernacle.....	Isaac Brown.....	Blackwoodtown, Camden co.....	Lide Edwards.....	Blackwoodtown, Camden co.....
90	Blackwood.....	Immanuel Pfeiffer.....	New Denmark, Gloucester co.....	H. P. Freise.....	New Denmark, Gloucester co.....
91	New Denmark.....	John Statesir, Jr.....	Colt's Neck, Monmouth co.....	D. D. Denise.....	Freehold, Monmouth co.....
92	Monmouth.....	Josiah Albertson.....	Ancora, Sussex co.....	John J. Jessup.....	Freehold, Monmouth co.....
93	Centennial.....	W. S. Hardin.....	Newton, Sussex co.....	R. M. Harden.....	Waterford, Camden co.....
94	Fredon.....	R. A. Leonard.....	Leonardsville, Monmouth co.....	R. S. Snyder.....	Fredon, Sussex co.....
95	Excelsior.....	D. C. Lewis.....	Cranbury, Middlesex co.....	Marsena Riggs.....	Fredon, Sussex co.....
96	Hightstown.....	N. S. Conover.....	Clinton, Hunterdon co.....	Martin Frace.....	New Monmouth, Monmouth co.....
97	Clinton.....	B. C. Spaulding.....	Clinton, Hunterdon co.....	Henry R. Taylor.....	Hightstown, Mercer co.....
98	Allentown.....	Gilbert H. Vannatter.....	Allentown, Monmouth co.....	Wm. A. Vannatter.....	Clinton, Hunterdon co.....
99	Holmdel.....	Geo. Kempton.....	Holmdel, Monmouth co.....	Russell Johnson.....	Allentown, Monmouth co.....
100	Pine Grove.....	John B. Fisher.....	Hammonton, Atlantic co.....	D. W. Hoppock.....	Holmdel, Monmouth co.....
101	Sergeantsville.....	Washington H. Hope.....	Sergeantsville, Hunterdon co.....	Theodore Guillardier.....	Hammonton, Atlantic co.....
102	Eatontown.....	Geo. Frace.....	Shrewsbury, Monmouth co.....	Henry Race, M. D.....	Stockton, Hunterdon co.....
103	Pittstown.....		Pittstown, Hunterdon co.....		Tinton Falls, Monmouth co.....

CONTENTS.

	Page
Organization of the Board.....	5-10
Annual Meeting ; President's Address.....	11-18
Introduction to Report ; Business ; Seasons, etc.....	19-21
Commercial Fertilizers	21-34
Preparation and Value of Fertilizers	21-31
Analyses of Fertilizers.....	31-34
Agricultural College Farm ; Experiments, etc.....	34-38
Remarks upon the New Jersey State Board of Agriculture, by J. B. Lawes	38-40
Influence of Droughts upon Crops, J. B. Lawes.....	40-44
Marls	45-138
Greensand Marls	45-130
Geographical Extent and Geological Structure.	45-54
Description of Localities, etc.....	54-76
Composition of the Greensand Marls.....	76-78
Marl Grains, or Greensand, or <i>Glauconite</i>	78-83
Chemical Analyses of the Greensand Marls	83-101
General Statements Regarding the Use of Marl.....	101-103
Letters Giving Practical Results of the Use of Marl.....	103-129
Conclusions Regarding the Use of Marl	120-130
Tertiary Marls	131-135
Calcareous Marls.....	136-138
Formula for Home-made Phosphate.....	139
Legislation Concerning Weights and Measures.....	141-142
Diseases of Domestic Animals.....	143-147
Annual Report of the N. J. State Horticultural Society.....	149-161
New Jersey Cranberry Growers' Association : Reports and Address	163-174
Appendix : List of Agricultural and Horticultural Societies..	175-185
Officers of the New Jersey State Grange, P. of H.....	187
List of Subordinate Granges, P. of H.....	188-189

INDEX.

A.		Page
Acid, Phosphoric.....	27	
Act Establishing the Board.....	5	
Address of Hon. Wm. A. Newell, President.....	11	
Age, Geological of the Greensand Marl Beds.....	53	
Agricultural Schools.....	13	
Agricultural College Farm.....	34	
Agriculture in New Jersey in 1819..	102	
Allen, Abner, on Use of Marl.....	122	
Ammonia, Percentage and Valuation of.....	25	
Ammoniated Dissolved Bone	32	
Ammonia and Phosphoric Acid, Com- parative Benefits of	160-161	
Analyses of Fertilizers.....	31	
Analyses of Soils, Remarks of J. B. Lawes on.....	39	
Analyses, Mechanical, of Greensand Marls.....	76	
Analyses of Greensand or Glauconite	81	
Analyses, Chemical, of Greensand marls.....	83	
Analyses, Chemical, of Clay Marls..	86	
Analyses, Chemical, of marls, Lower Marl Bed.....	87-91	
Analyses, Chemical, of Indurated Green Earth.....	92	
Analyses, Chemical, of Marls, Middle Marl Bed.....	93-98	
Analyses of "Chocolate Marls".....	97	
Analyses of Yellow Limestone and Limesand.....	97	
Analyses, Chemical, of Marls, Upper Marl Bed.....	98-100	
Analyses of Tertiary Marls.....	132, 133	
Apples, Cultivation of.....	153, 154	
Apples, Varieties Recommended.....	155	
Armsby H. P., Paper Translated by..		
Ash marl of the Upper Marl Bed...	73	
Ashes, Leached Wood, Analysis of..	34	
Ash Marl, Upper Marl Bed, Analyses of	99	
B.		Page
Barrett, W. E., on Use of Marl.....	125	
Blackberries, Varieties Recommended	158	
Blight in the Pear.....	151-153	
Blue Ball, Analyses of Marl from....	93	
Blue Marl, (Lower Marl Bed).....	59	
Blue Marl of the Upper Marl Bed...	73	
Bone, National Soluble.....	32	
Bone, Ground, Analyses of.....	33	
Borton, Omar, on Use of Marl.....	121	
Boulder Drift.....	121	
Buckelew, F. L., on Use of Marl.....	124	
Burlington county, Localities of Low- er Marl Bed in.....	63	
Burlington county, Middle Marl Bed in	68	
Burlington county, Marls of Middle Bed, Analyses of.....	94	
Burlington county, Upper Marl Bed in.....	75	
Burlington county, Marls of Upper Bed, Analyses of	100	
By-Laws of the Board.....	7	
Byrnes, R. J., on Use of Marl.....	117	
C.		Page
Calcareous Marls, Localities of...	136-138	
Calcareous Marls, Composition and Value of.....	138	
Camden county, Localities of Lower Marl Bed in	63	

	Page
Cattle, Diseases of.....	143-147
Chemical Composition of Greensand or <i>Glaucanite</i>	83
Chemical Analyses of Greensand Marls.....	83-100
Cherries, varieties recommended.....	157
Chocolate Marls, (Middle Marl Bed,) analyses of.....	97
Clay Marls.....	54
Clay Marls, localities of.....	56
Clay Marls, chemical analyses of.....	86
Clay Marls, effects of use of.....	87
College, Agricultural, farm of.....	34
Committees of the Board.....	7
Conover, William V., letter on uses of Marl.....	103
Coombs, Wm. A., on use of Marl.....	119
Cooper, Alex. O., on use of Marl.....	116
Corn, Indian, experiments upon the growth of.....	34
Cranberry Growers' Association, measures of.....	141, 142
Cranberry Growers' Association, Report of.....	163-174
Cranberries, Statistics of.....	168-173
Camden county, Middle Marl Bed in	68
Camden county, Upper Marl Bed in..	76
Camden county, analyses of marls of middle bed.....	95
Camden county, Marls of Upper Bed, analyses of.....	100
Cretaceous Period and Rocks.....	53
Cream Ridge Marl Co., analyses of marl of.....	84, 94
Crops, influence of drought on.....	40
Currants, varieties recommended.....	159

D.

Dickinson's pits, Woodstown, analyses of marl from.....	84, 96
Diseases of Domestic Animals.....	143-147
Drift, Boulder.....	21
Drought in 1876.....	19
Drought, influence of.....	40
DuBois, T. V., on use of marl.....	111

E.

Epizootic Pneumonia.....	144, 145
Executive, Committee of the Board	8
Experiments upon Indian Corn.....	34
Experiments upon the Growth of Wheat.....	37

F.

Farm Lands, Value of.....	12
Farmingdale, Marl Pits near.....	74
Fenwick, Jas. A., on use of Marl..	127

	Page
Fertilizers, Commercial.....	21
Fertilizers, Valuation of.....	24
Fertilizers, Analyses of.....	31
Fertilizers, Experiments with.....	34
Fertilizers for Fruit Growing.....	159-161
Forman, John F. T., on Use of Marl	123
Fossils of the Greensand Marl.....	53
Fossils of the Clay Marls.....	56
Freehold, Analyses of Marls near...	90
French, N. R., Statistics of Cranberries.....	168-173
Fruit, List of Varieties Recommended.....	155-159
Fuller's Earth in Yellow Sand Bed..	72
Fuller's Earth, Analysis of.....	99

G.

Geological Structure of the Greensand Marls.....	47
Glaucanite, or Greensand.....	78
Gloucester county, Localities of Lower Marl Bed in.....	63
Gloucester county, Middle Marl Bed in	69
Gloucester county, Analysis of Marl from.....	91
Gloucester county, Analyses of Marls of Middle Bed.....	95
Gordon's Gazetteer, Extract from	101
Gooseberries, Varieties Recommended	158
Grape Culture and Varieties.....	155
Griscom, Wm. Wade, on use of Marl	118
Green Earth, Indurated.....	65
Green Earth, Indurated, Analyses of	92
Green Marl of the Middle Marl Bed	66
Green Marl of the Upper Marl Bed..	73
Greensand, or Glaucanite.....	78
Greensand, Specific Gravity of.....	80
Greensand, Chemical composition of..	83
Greensand Marls, Geographical Extent of.....	45
Greensand Marls, Geological Structure of.....	47
Greensand Marl Beds, Sub-divisions..	48
Greensand Marl Beds, Geological Age of.....	53
Greensand Marl Beds, Strike and Dip of.....	51
Greensand Marl Beds, Thickness of..	52
Greensand Marls, Mechanical Analyses of.....	76
Greensand Marls, Chemical Analyses of.....	83
Greensand Marls, General Statements as to its Use.....	101
Greensand Marls, Questions as to its use.....	103
Greensand Marls, Conclusions on Use of.....	129-130

	Page
Greensand Marl, letters on use and value of.....	103-129
Gryphea Vesicularis.....	59-67
Guanos.....	22
Guano, Marine. Analyses of.....	33
Guano, Peruvian, Analyses of.....	31

H.

Hay, John, on use of Marl.....	117
Herbert, J. W., on use of Marl.....	109
Herbert, O. C., on use of Marl.....	111
Heritage's Pits, Hurffville, section at	69
Heritage's Pits, Hurffville, analyses of Marl from.....	95
Higgins, J. C., on Contagious Pleuro-pneumonia.....	143-145
Howell, Lewis, on use of Shiloh Marls.....	134, 135
Horticultural, N. J. State Society of, Report of.....	149-161
Hurffville, Section of, Marl Bed at...	59

I.

Indurated Green Earth.....	65
Indurated Green Earth, Analyses of,	92

J.

Jobes, Thomas B., on Use of Marl...	126
Johnson, Thomas, on Use of Marl...	126
Jones, Samuel W., Letter of, on Use of Marl.....	106

K.

Kirkwood, Analysis of Rodgers' Marl at.....	95
---	----

L.

Lacustrine.....	34
Lawes, J. B., Remarks of.....	38
Laws Relating to the Board.....	5
Legislation Concerning Weights and Measures.....	141
Letters on Uses and Value of Greensand Marl.....	103
Limestone, Yellow.....	67
Limestone, Yellow, Analyses of.....	97
Limesand, Analyses of.....	97
Lippincott, James, Letters on Pleuro-Pneumonia.....	145, 146
Lippincott, Jesse, on Use of Marl...	120
Lippincott, Samuel M., on Use of Marl.....	120
Lower Marl Bed, Section of.....	58
Lower Marl Bed, Layers of.....	59
Lower Marl Bed, Localities of.....	60
Lower Marl Bed, Composition of Marl of.....	76

Page

Lower Marl Bed, Chemical Analyses of Marls from.....	87-91
Lower Marl Bed, Letters on Use of Marls of.....	103-115
Lung Plague, Losses by.....	147

M.

Manures in Dry Years.....	42
Mapes, Chas. V., Table of.....	24
Marls.....	45
Marl Beds, General Subdivision of the.....	49
Marl, Lower Bed.....	59
Marls, Middle Bed.....	66
Marls, Upper Bed.....	73
Marls, Upper Marl Bed, Analyses of.....	98-100
Marls, Greensand, Mechanical Analyses of.....	76
Marl Grains, Greensand.....	78
Marls, Greensand, Chemical Analyses of.....	83
Marl, Greensand, General Statements as to its Use.....	101
Marl, Greensand, Questions as to its Use.....	103
Marl, Greensand, Letters on Uses and Value of.....	103
Marls, Greensand, Conclusions on Use of.....	129, 130
Marl, Greensand, First Use of.....	109
Marl at Squankum First Used.....	124
Marls, Tertiary, Analyses of.....	132, 133
Marls, Tertiary, Use and Value of.....	133-135
Marls, Calcareous, Localities of.....	136-138
Marls, Calcareous, Composition and Value of.....	138
Marls, Tertiary, Localities of.....	131, 132
Marlborough, Monmouth county, Marl.....	62
Marlborough, Monmouth county, Analyses of Marls.....	88
Measures and Weights, Standard....	141
Measures, Standard of the N. J. Cranberry Growers' Assoc'n.....	141, 142
Meetings of the Board.....	7
Middle Marl Bed, Detailed Description of.....	66
Middle Marl Bed, Localities of.....	67
Middle Marl Bed, Columnar Section of.....	69, 70
Middle Marl Bed, Composition of Marl of.....	77
Middle Marl Bed, Analyses of Marls from.....	93-98
Middle Marl Bed, Letters on Use of Marls of.....	107, 115-122
Miocene Marl.....	131-135
Monmouth county, Lower Marl Bed in	60

	Page
Monmouth county, Analyses of Marls from Lower Bed	87-91
Monmouth county, Middle Marl Bed in	67
Monmouth county, Marls of Middle Bed, Analyses of	93, 94
Monmouth county, Upper Marl Bed in	74
Monmouth county, Marls, Upper Bed, Analyses of	98, 99
Morse's Geography, Extract from....	102

N.

Navesink Highlands, Marl at.....	60
Navesink Highlands, Analyses of Marls from.....	87
New Egypt, Upper Marl Bed near...	75
New Egypt, Analyses of Marls from vicinity of	100
New Jersey in 1830, by Thos. Gordon.....	101
New Jersey, Soil and Agriculture in 1819, Morse	102
New Jersey Cranberry Growers' Association	163
New Jersey State Horticultural Society, Report of	149-161
Newell, Hon. Wm. A., Address of....	11
Newell, Hon. Wm. A., on Use of Marl	115
Nitrogen in Soils.....	40

O.

Ocean county, Middle Marl Bed in...	68
Ocean county, Upper Marl Bed in...	75
Ocean county, Marls of Upper Bed, Analyses of	100
Orcharding	153-155
Organization	5
<i>Ostrea larva</i>	60

P.

Paleontology of the Greensand Marl Beds.....	54
Peaches, Varieties Recommended....	157
Pear Blight	151, 152
Pears, List of Varieties Recommended	156
Pemberton Marl Company, Section at Pits of	68
Pemberton Marl Co., Analyses of Marls of	84, 94
Pettit, Frank, on Use of Marl.....	121
Phosphates	32
Phosphoric Acid, Percentage and Valuation of	27
Phosphate, Formula for Home-made	139

	Page
Phosphoric Acid and Ammonia, Comparative benefits of.....	160, 161
Pleuro-Pneumonia.....	143
Plums, Varieties Recommended.....	157
Pneumonia, Epizootic.....	144, 145
Popplein's Silicated Superphosphate	33
Potash, Percentage and Valuation of	30
President's Address.....	11

Q.

Questions on Use of Greensand Marl	103
Quinces, Varieties Recommended....	159

R.

Rainfall, 1876.....	20
Rainfall and Drought.....	41
Raspberries, Varieties Recommended	157
Red Sand Bed.....	64
Red Sand Bed, Localities.....	65
Rinderpest or Pleuro-Pneumonia...	143
Robertson, Aaron, Experiments of..	36
Rodgers, Minor, Marl of.....	68, 95
Rue, N. S., on Use of Marl.....	115

S.

Salem county, Localities of Lower Marl Bed in	64
Salem county, Middle Marl Bed in..	70
Salem county, Analyses of Marls from	91
Salem county, Marls of Middle Bed, Analyses of.....	96
Sand Marl.....	59
Sand Marl, Lower Marl Bed, Analyses of.....	90
Schenck, Rev. G. C., Letter of, on Use of Marl.....	108
School of Agriculture.....	13
Section from Rahway to Deal.....	49
Section, Columnar of the Greensand Marl Beds.....	50
Section, Columnar of the Greensand Marl Beds.	57
Sections, Columnar, of Middle Marl Bed	69, 70
Shell Marl.....	34
Shell Marls	136-138
Shell Layer of the Middle Marl Bed.	67
Shiloh Marl	132-135
Silicated Superphosphate.....	33
Soils	21
Soil Analyses, Remarks of J. B. Lawes upon.....	39
Soils, Nitrogen in.....	40
Soil and Agriculture of New Jersey in 1819	102
Smock, Uriah, on Use of Marl.....	111

	Page		Page
Squankum, Localities of Marl, about	74	Upper Marl Bed, Localities of.....	74
Squankum Marls, Analyses of.....	84, 99	Upper Marl Bed, Composition of the Marl of.....	78
Squankum Marl Co., Section at Pits of.....	72	Upper Marl Bed, Analyses of Marls of.....	98-100
Squankum Marl Co., Analyses of Marls of	84, 99	Upper Marl Bed, Letters on Use of Marls of.....	122-129
Squankum and Freehold Marl Co., Analyses of Marls of.....	84, 99	Van Doren, John, on the Use of Marl.....	113
Squankum Marl First Used.....	124	Van Mater, Joseph I., Letter of, on Use of Marl.....	104
Squankum Marl, Letters on the Use of.....	123-126	Van Meter, Robert, on Use of Marl..	120
Squash, Excelsior	150	Vansant, Wm. S., on Lung Plague in Cattle.....	147
Statistics of Cranberries.....	168-173	Vegetables, Report of Horticultural Society, Committee on.....	149, 150
Stratton, N. T., Pits of.....	70	Vincentown Marl Company, Analy- sis of Marl of.....	84
Stratton, N. T., Analyses of Marls of	96		
Strawberries, Varieties Recommend- ed	158		
Superphosphates, Analyses of.....	32		
Sussex county, Calcareous and Shell Marls in.....	136-138		

T.

Taylor, Michael, Letter of, on Use of Marl.....	105
Terebratula, Harlani.....	67
Tertiary Marls, Localities of.....	131, 132
Tertiary Marls, Analyses of.....	132, 133
Tertiary Marls, Use and Value of.....	133-135
Thompson, Dr. J. C., on Use of Marl	112
Thurber, Prof. George, Address of....	151
Tomlinson, Ephraim, on Use of Marl	116

U.

Upper Marl Bed, Sub-divisions of.....	73
Upper Marl Bed, Columnar Sections of.....	72-74-75

W.

Warren county, Shell Marls in.....	137
Weights and Measures, Standard....	141
West Jersey Marl and Transporta- tion Company, Analyses of Marls of	84, 95, 97
Wheat, Experiments upon the Growth of.....	37
Wood Ashes, Analysis of.....	34

Y.

Yellow Limestone and Limesand....	67
Yellow Sand Bed, Description and Localities of.....	71
Yellow Limestone and Limesand, Analyses of.....	97

FIFTH ANNUAL REPORT

OF THE

NEW JERSEY

State Board of Agriculture,

FOR THE YEAR

1877.



TRENTON, N. J.:
NAAR, DAY & NAAR, PRINTERS.

1877.

OFFICERS OF THE BOARD.

PRESIDENT.

HON. WM. A. NEWELL Allentown

SECRETARY.

GEO. H. COOK New Brunswick

EXECUTIVE COMMITTEE.

WM. M. FORCE Newark

WM. A. NEWELL Allentown

GEO. W. ATHERTON New Brunswick

P. T. QUINN Newark

GEO. H. COOK New Brunswick

1600. A. D.

ANNUAL MEETING, 1877.

TRENTON, February 21, 1877.

The Annual Meeting of the Board was held in the Chancery Court room, at 11:30 A. M.

The following members were present:

President, Hon. Wm. A. Newell, Board of Visitors to the Agricultural College, Allentown.

Secretary, Prof. Geo. H. Cook, State Geologist, New Brunswick.

Chas. E. Elmer, Board of Managers, Geological Survey, Bridgeton.

P. T. Quinn, Secretary State Agricultural Society, Newark.

Geo. Thurber, President New Jersey Horticultural Society, Passaic.

Omar Borton, President West Jersey Agricultural and Horticultural Association, Woodstown.

Ralph Ege, West Hopewell Farmers' Club, Hopewell.

E. W. Crane, Delegate of State Cranberry Growers' Association, Caldwell.

Noah W. Parcell, President Union County Farmers' Club, Elizabeth.

Ferdinand S. Holcombe, Director Hunterdon County Agricultural Society, Flemington.

Elisha E. Holcombe, President Union Farmers' Club, Mt. Airy.

Edward Burrough, President Farmers' Mutual Benefit Association, Mechanicsville.

N. S. Rue, President Monmouth County Agricultural Society, Cream Ridge.

Jas. Lippincott, President Mount Holly Farmers' Club, Mount Holly.

Geo. W. Atherton, Faculty of Rutgers College, Agricultural Department, New Brunswick.

J. C. Smock, Faculty of Rutgers College, Agricultural Department, New Brunswick.

Chalkley Albertson, Board of Visitors of Agricultural College, Haddonfield.

The annual report was read by the Secretary and accepted.

The following resolution was adopted :

“That the several State and county agricultural societies, which are entitled to representation in this Board, be requested hereafter to choose regularly among their other officers, one who shall be known as their ‘Delegate to the State Board of Agriculture,’ and notify the Secretary of the same.”

At the afternoon session the President gave an address, and exhibited fine specimens of corn grown upon his farm.

After some discussion upon topics relating to agriculture, the following resolution was passed :

“*Resolved*, That a special committee of five be appointed to consider the subject of agricultural education, its principles, its feasible methods and its ascertained results, and the means of promoting it, and that the committee present a report to the Executive Committee in time to be embodied in the next annual report of this Board.

On motion the spring meeting of the Board was appointed to be held at the Agricultural College Farm, on the second Wednesday in June. The fall meeting was left to be appointed by the Executive Committee, and the winter meeting to be held as now, on the third Wednesday in February. The following officers were re-elected: Hon. Wm. A. Newell, President; Geo. H. Cook, Secretary; Wm. M. Force, Wm. A. Newell, Geo. W. Atherton, P. T. Quinn and George H. Cook, Executive Committee.

SPRING MEETING.

The spring meeting of the Board was held at the State Agricultural College Farm, New Brunswick, on Wednesday, June 13th, 1877. There were present, Hon. Wm. A. Newell, President, Geo. H. Cook, Secretary, Wm. M. Force, Esq., Col. Benj. Ayerigg and Chas. E. Elmer, Esq., of the Board of Managers of the Geological Survey, John De Mott, Esq., and Chalkley Albertson, Esq., from the Board of Visitors to the Agricultural College, P. T. Quinn, E. W. Crane, F. S. Holcombe, N. W. Parcell, Geo. T.

Haines, Omar Borton, N. S. Rue, H. I. Budd, James Lippincott and J. C. Smock.

The President made a few remarks welcoming the members, and stating the object of the meeting. The Secretary then took the party in charge and pointed out the farm arrangements, crops, modes of culture and other matters of interest. When the circuit of the farm had been made, the Secretary said that the farm contained about one hundred acres. When purchased by the College it was very poor wet and in a very neglected condition. During the past ten years there had been over seven miles of tile drains laid. All of the lateral drains are of two inch round pipes, with six inch pipes of the same pattern for the main drains. To do this work was the first important step taken towards permanent improvement. This was followed, as fast as the means would allow, with deep tillage and heavy manuring, and the Professor said he was thoroughly convinced that this was the best policy for modern intelligent farmers to follow, and he pointed to his growing crops for corroboration of his statements.

During the past year a new barn 40x60 has been built in a favorable location, and this structure has all the modern improvements, with an abundant supply of water in barn and yard. It adds to the appearance of the outbuildings and is found to be a great saving in keeping and feeding neat cattle.

The crops now growing on the farm consist of twenty-seven acres of meadow, thirteen acres of wheat, twelve acres of corn, five acres of rye, five acres of pasture, eight acres of oats, four acres of cabbages, four acres of ruta bagas, two acres carrots, two acres beets, making a total of eighty-four acres. A vegetable garden, with the waste land around the dwelling house and outbuildings, makes up the balance of the one hundred acres.

The grass crop is showing the effect of last summer's drought, followed by a very dry May, which will lessen the yield about one-third at harvest time, even with plenty of rain from now until then. The other crops are looking remarkably well, and the field of wheat, one-half Clawson and the balance Fultz, was unusually fine, with an even stand of straw and the heads well developed. Practical farmers, accustomed to grain raising, set this field down for a yield of from twenty-five to thirty bushels to the acre, which is about twice as much as the average yield of

the State. This too, is growing on land that a dozen of years ago wouldn't produce enough of grain on an acre to feed a goose.

Of the varieties of wheat the Fultz is decidedly the most promising, and will no doubt become a favorite sort with grain farmers in our State, when all its good characteristics are better known. The corn crop has a rich, dark color, but it is too early in the season to speculate on the yield, so much depends on the weather.

The working stock kept on the farm are three horses and a pair of mules. Besides these there are thirteen milch cows, mostly common stock, and valued for their milking qualities. Those, with a lot of "Jersey Red" pigs, constitute the live stock on the farm.

After dinner in the farm house the visitors were invited to witness some experiments with farm implements on a piece of sod ground, part of which was ploughed a week or more ago, and some of the sod was still unturned. The first trial was with a novel implement manufactured at Chicago and named the "American Rotary Plow;" it is constructed upon a new principle, and instead of using the wedge, drawn through the ground, the soil is turned by a circular disc that looks like a pan, with the bottom removed, set upon an axle at an angle of about forty-five degrees to the line of draught. This disc is easily elevated or depressed by a handle under the control of the driver, and is drawn by being attached to an axle, upon which are two wheels, one of which runs in the furrow and the other upon the land side. A castor wheel runs in the furrow behind the driver. The disc is forced into the ground by reason of the draught being in the rear of the disc, and some six inches above its centre, thus pushing down upon it as well as drawing it forward. This plow does not require any "Castor" or other Coulter, as it is a most perfect "Coulter itself," and will cut the toughest sod or the largest crop of corn-stalks with ease.

The ground on which this new plow was tested was not in good condition for this sort of experiment, and the plow did not produce a favorable impression on the minds of those who watched it working. On the sod ground it did its work in a slovenly way, leaving the uncovered grass in bunches here and there, while in cross plowing the part already turned, squared

blocks of the green sod was thrown on the surface and made unsightly work of it. Those who were interested claimed that this plow would turn a furrow twenty-four inches wide and six inches deep in stubble or sod, with less power than turning a ten-inch furrow and six inches deep with the best pattern of our modern plows. There was no instrument there to test this statement, but it would need one to convince most of the farmers present of the truth of it.

The New York Plow Company had a couple of their Adamant plows, made in Newark, which were tried, and both of them worked well in the hard dry soil. Besides those there was a stretch of steel-wire fence recently put up on one side of the farm, that would be an excellent protection around a fruit orchard. It is made with a double strand of steel wire, with sharply pointed steel wire "barbs" fastened on each strand every ten inches. It is next to impossible for man or beast to get over or through this fence without leaving a part of their clothing behind them. The cost of a fence of this kind, with five strands would be about five dollars for every hundred feet, exclusive of the posts.

A Steaming Apparatus manufactured in Cleveland, Ohio, was on exhibition, and seemed to do the work of steaming food for cattle at a low cost and very thoroughly.

The day at the College Farm was an enjoyable one, and before leaving, every person present seemed thoroughly satisfied with his day's pleasure.

At the close of the meeting, on motion of Chalkley Albertson, it was

Resolved, That the State Board of Agriculture having closely inspected the State Agricultural College Farm, do hereby express our gratification at its greatly improved condition, and especially for the excellence of the various crops growing thereon; that the management reflects great credit upon the distinguished Professor of Agriculture, Dr. Cook, who, by his intelligence and perseverance, has produced from a comparative wilderness one of the most beautiful and fertile plantations in the State, and which cannot fail to be a source, from which will be disseminated the report of useful experiments in the production of crops and the presentation to the public of the best agricultural machinery.

"That we have witnessed with much satisfaction the operation

of machinery exhibited here to-day ; that the “ Empire Adamant Plow ” and the “ Improved Ten Eyck Plow ” merit and receive our unanimous approval ; that we are especially impressed with the new rotary plow, which introduces a new principle as applied to plowing, that of the wheel and axle in place of the wedge principle of ordinary plows, by which improvement one team can cultivate four acres a day.

“ Also, that we extend our approval to a new wire-barbed fence, which effectually precludes depredations ; and to the new apparatus before us, for steaming food for cattle ; and, that we invite more extended exhibitions of a like nature in the future.”

COMMERCIAL FERTILIZERS.

The use of commercial fertilizers is steadily increasing among our best farmers ; and much more discrimination is made in regard to the kinds used, and the crops to which they can be most profitably applied. And there is a large and increasing body of farmers who are experimenting with chemical fertilizers, so as to settle practically for their own soils the question as to what elements are lacking in the soil and need to be supplied in purchased manures. The large dealers in commercial fertilizers have found the demand for chemical manures containing potash, phosphoric acid and ammonia separately, so great that all of them are prepared to supply such of guaranteed strength and purity, either separately or mixed in any proportions that may be ordered. This is a great advance on the condition of agriculture five years ago, and it only needs now that intelligence among farmers which comes from study and experience, in order to get the full benefit of fertilizers, and to avoid useless expense for such as are not needed. The action of fertilizers varies with different crops—it also varies with the same crops upon different soils—and it differs entirely with wet and dry seasons. Climate also has some influence upon the effect of fertilizers. And upon the whole it must be understood that the skill and experience of the farmer is always the first and essential element for the successful use of fertilizers.

Formula for the preparation of complete chemical manures for wheat and all grain crops, for corn, for potatoes, for turnips, and various other crops, were published by M. Ville, a French agricultural chemist, and have been very extensively used. The

manures can be bought of C. V. Mapes, 158 Front street, New York; H. J. Baker & Brother, 215 Pearl street, New York, and probably of many others, in any of the cities or large towns.

The Stockbridge fertilizers, which are prepared in Boston, are calculated to contain all the elements in proper proportion, that are needed in a crop of corn, wheat, potatoes, or other product—and the weight needed for a hundred bushels or other quantity of produce is given. These manures are on trial in many places, and good results may come from their use. It is, however, not to be expected that they will be so economical as those which a skillful farmer can prepare for his own soil and crops, after he has made judicious experiments for himself.

Bone manures and super-phosphates, such as are prepared and sold by responsible parties, have held their place in the estimation of farmers, better, perhaps, than any other commercial fertilizers. When once upon the soil they remain till taken out by the growing crops. An unfavorable season may hinder their immediate action, but they then show their valuable properties on the succeeding crops. Ammoniacal and potash manures produce striking results in favorable seasons, but in unfavorable seasons more or less of their substance is lost.

The common and long tried fertilizers, lime, plaster and marls, which have heretofore done so much service to farmers, are still as valuable as ever they were. A considerable space was devoted to the description of the greensand marls, in the report of last year; and the report of 1875 contains a lengthy account of the limes and limestones of New Jersey, and their uses in agriculture. In the present report the deposits of shell-marl, so common in Sussex and Warren counties, are described, and some account is given of their uses as fertilizers.

The chief supply of manure to enrich the soil and increase its products must however still be obtained from the barnyard and stable. And the skill and judgment with which this part of farm economy is carried out, is a fair measure of the thrift of any farmer. One important means of improving the quality of farmyard manures is by the use of bran, malt-dust, meal, and other low-priced materials for cattle food. But a small part of these substances is appropriated to increasing the weight of the animals fed on them, and the rest is accumulated in the manure. The following table gives the percentage of fertilizing constituents in

several common substances that are used for the food of animals. They are low-priced, and can be bought so as to be cheaper for the farmer and more certain to prove satisfactory in their use for the supply of manures than most commercial fertilizers. In fact, if their manurial value is computed from the accompanying table of prices it will be seen that some of them are worth most of their cost to apply to the soil at once, and without any of the profit which should come from their use in feeding stock; thus the wheat bran is worth \$15 and the malt sprouts \$23 a ton, for manure.

SUBSTANCE.	Elements of Ammonia.	Potash.	Soda.	Lime.	Magnesia.	Phosphoric Acid.
Maize (Indian Corn).....	1.85	0.27	0.03	0.06	0.14	0.43
Oats	2.22	0.42	0.10	0.10	0.18	0.55
Rye Flour.....	1.94	0.65	0.03	0.02	0.14	0.85
Rye Bran.....	2.68	1.93	0.09	0.25	1.13	3.42
Wheat Bran.....	2.59	1.33	0.03	0.26	0.94	2.88
Brewers Grains.....	0.91	0.05	0.01	0.14	0.12	0.46
Malt Sprouts.....	5.60	2.19	.....	0.09	0.08	1.73
Linseed Cake.....	5.23	1.29	0.08	0.47	0.88	1.94
Cotton Seed Cake.....	.....	2.18	.....	0.28	0.26	2.95
Baltimore Meal*.....	2.05	0.47	.....	0.00	0.32	1.13

The following are the "estimated values per pound" of the ordinarily occurring forms of ammonia, phosphoric acid and potash, as recently found in the New York and New England markets, and published by the Connecticut Agricultural Experiment Station, New Haven, Conn.:

	Cents, per pound.
<i>Ammonia</i> , or its equivalent in nitrates and ammoniacal salts	20
" in Peruvian guano, fine steamed bone, dried and fine ground blood, meat and fish.....	16½
" in fine ground bone, horn and wool dust.....	15
" in coarse bone, horn shavings and fish scraps.....	12½
<i>Phosphoric Acid</i> , soluble in water.....	12½
" " <i>reverted</i> , and in Peruvian guano.....	9

*Baltimore Meal is the refuse from the hominy mills, and consists chiefly of the chits of the kernels of corn.

	Cents, per pound.
<i>Phosphoric Acid, insoluble</i> , in fine bone and fish guano.....	7
“ “ in coarse bone, bone ash and bone black.....	5
“ “ in fine ground rock phosphate.....	3½
<i>Potash</i> in high grade sulphate.....	9
“ in kainite, as sulphate.....	7½
“ in muriate, or potassium chloride.....	6½

ANALYSES OF COMMERCIAL FERTILIZERS MADE IN THE STATE
LABORATORY.

Standard Bone Superphosphate.

Phosphoric acid, soluble.....	6.91
“ “ reverted.....	4.09
“ “ in bone.....	2.82
Potash.....	1.70
Ammonia.....	2.73
Lister Brother, Newark.	

Ground Bone.

Phosphoric acid, soluble.....	1.60
“ “ in bone.....	11.79
Ammonia.....	3.70
Lister Brother, Newark.	

Fine Bone Dust.

Phosphoric acid.....	30.72
Ammonia.....	2.20
Peter Cooper, 17 Burling slip, New York.	

Guaranteed Guano.

	1	2
Phosphoric acid, soluble.....	5.76	4.61
“ “ insoluble.....	13.70	13.57
Ammonia.....	9.37	6.42
Potash.....		2.90
C. V. Mapes, 158 Front street, New York.		

Rectified Guano.

Phosphoric acid soluble.....	12.67
Ammonia.....	10.56

Potash	1.80
C. V. Mapes, 158 Front street, New York.	

Muriate of Potash.

Containing of pure potash.....	50 per cent.
--------------------------------	--------------

Potash Salts.

Containing of pure potash.....	45 per cent.
--------------------------------	--------------

Sulphate of Ammonia.

Containing of pure ammonia.....	25 per cent.
---------------------------------	--------------

National Soluble Bone.

Phosphoric acid, soluble.....	8.32
“ “ reverted	3.52
“ “ insoluble	5.12

National Soluble Bone Company, Camden.

Superphosphate of Lime.

Phosphoric acid, soluble.....	0.90
“ “ reverted	2.30
“ “ insoluble	13.70
Ammonia.....	3.07

Lane & Johnson, Newark, N. J.

Orchilla Guano.

Phosphoric acid, soluble.....	4.67
“ “ insoluble.....	14.59
Ammonia.....	0.20

Sold by Summerill & Hires, Penns Grove, Salem county, N. J.

Guanape Guano.

	1	2
Phosphoric acid, soluble.....	2.62	5.67
“ “ reverted	5.72	7.67
“ “ insoluble.....	14.28	2.91
Ammonia.....	5.65	10.10
Potash	4.37	3.50
Water (loss at 212°).....	14.50	12.50

Sold by Francis Danzenbaker, Bridgeton and Roadstown, Cumberland county.

Forrester's Cabbage Fertilizer.

Phosphoric acid, soluble.....	2.20
“ “ reverted	2.72
“ “ insoluble.....	0.20
Ammonia.....	8.52
Potash	13.36

This fertilizer is prepared and sold by H. Baker & Brother, 215 Pearl street, New York.

Forrester's Corn Fertilizer.

Phosphoric acid, soluble.....	3.77
“ “ insoluble.....	1.35
Ammonia	5.37
Potash	7.76

Prepared by H. J. Baker & Brother, 215 Pearl street, N. Y.

Pure Ground Bone.

Phosphoric acid.....	25.34
Ammonia.....	4.48

Phosphoric acid is equivalent to 55.24 per cent. of bone phosphate.

Prepared at Newark, N. J., by Lane & Johnston.

Fish Guano.

Phosphoric acid, soluble.....	0.19
“ “ insoluble.....	7.09
Ammonia.....	5.93
Potash	2.02
Water (loss at 212°).....	25.50

James E. Otis, Tuckerton, Burlington county.

Wood Ashes—(1) Unleached—(2) Leached.

	1	2
Lime..	33.04	36.55
Phosphoric acid.....	1.66	1.66
Potash	7.06	0.70
Magnesia	3.02	3.40
Oxide of iron and alumina.....	1.00	1.74
Carbonic acid.....	28.82	29.26
Sulphuric acid.....	0.72	0.24
Insoluble in acid.....	8.40	10.95

Bog Ashes.—Some bog ashes, from a woods fire in Pigeon Swamp, in Middlesex county, was brought to the laboratory by

J. S. Bennett, of Rhode Hall. There was a large amount of this ashes, and its application as a fertilizer was at once suggested by the neighboring farmers, and an analysis was requested, to indicate its value. An examination showed small percentages of the constituents ordinarily found in wood ashes and its worthlessness, excepting as an amendment to the soil, in improving its texture.

The following extract of a letter from Mr. Bennett gives the results of its use on their lands :

“I used it very heavy on timothy sod, for mowing, and I could not see that it did any good. But where it was used on poor ground, for rye, it helped it very much. Several of us used it on wheat, and some think it helped very much. For my part, I could not see where I put it.”

“*Lacustrine*,” “*Lake Guano and Shell Fertilizer*,” “*Bird Guano and Shell Fertilizer*.”—Fertilizers bearing these names have been quite recently put in the commercial fertilizer market, and sold to dealers and farmers in New Jersey. They have been represented as “real nourishment of the soil, that is enriching without ‘burning it up,’ * * * a well known property of guano,” and as containing from one to three per cent. of phosphoric acid, and like amounts of potash, with small percentages of ammonia, &c., &c. In one case a lot was sold as “pure Peruvian guano.” A specimen of the latter sent to the State laboratory was found to be a shell marl, very like those described in this report, and which are used in the northern part of this State. Specimens from the *Lacustrine Fertilizer Company*, of New York City, and from other dealers, as well as purchasers, have been examined. They are all calcareous or shell marls. A carefully made analysis of one of these, and which may be considered as a fair representative of these *fertilizers*, gave :

Lime	42.40
Magnesia	1.22
Carbonic acid.....	35.16
Alumina and oxide of iron.....	1.37
Insoluble in acid.....	14.30
Potash	0.15
Phosphoric acid.....	0.13
Ammonia	0.27
Water and organic matter.....	5.00
	<hr/>
	100.00

The marl sold as Peruvian guano was put at \$15 per ton. The Lacustrine Fertilizer Company offered its *fertilizer* at \$10 a ton. Others put the prices lower. These imported marls came (as we are informed) from the Montezuma marshes, New York.

We have in our own State such marls, in large deposits, and there are several localities, some of which are near railroad transportation. The owners and enterprising men would put them in the market at much lower prices than these here given, and they would be sold as *Calcareous Marls*. Their localities have been fully described in another part of this report. And following these descriptions are a number of letters from farmers who have used them, and their testimony indicates the value of such marls, especially when mixed with muck or other organic matter. They are valuable amendments to the soil, but they do not contain phosphoric acid or phosphates to such extent, so as to be compared with high priced fertilizers. The potash likewise is inconsiderable, and the ammonia is not more than some good soils contain. These constituents are not present in quantities large enough to entitle such marls to places among commercial fertilizers. Our best greensand marls, which sell at \$1 or \$2 per ton delivered, contain many times as much phosphoric acid and potash, and the remaining constituents, carbonates of lime and magnesia, and organic matter in form of muck, these are not included in the tables for valuing commercial fertilizers. These marls are valuable *at home*, or where they can be obtained at \$1 or \$2 per ton, but it is not proper to call them commercial fertilizers, nor honest to call them "pure Peruvian guano." "Lacustrine" and "lake guano" are well enough if these terms are explained to mean in common language and to be understood by the purchaser, as calcareous or shell marls.

SHELL OR CALCAREOUS MARLS.

Marls of this variety are very abundant in the counties of Sussex and Warren, in Northern New Jersey; and they are found to some extent in Cumberland and Cape May counties, in the southern part of the State. And there are beds of the greensand marl, which are highly calcareous, in the counties of Monmouth, Ocean, Burlington, Camden, Gloucester and Salem.

Such marls have not received the attention and approval in

New Jersey which they deserve, especially not in northern New Jersey.

These marls consist essentially of the shells of various testaceous animals, which grew in water, and which, after the death of the animal, have crumbled to fine powder. Those found in the marls of Sussex and Warren counties have been mainly accumulated in fresh water; those in the marls of the other counties above named are of salt water origin, but in both cases they consist of carbonate of lime and, except in being soft and earthy, do not differ from common limestone.

Their usefulness as a fertilizer, or as an *amendment* to the soil, is recognized in most countries. They have been used profitably in England for several hundred years. There are leases going back to the times of Edward I. and Edward II., in which the tenant was required to use a certain quantity of marl every year. And in all that part of England where chalk is found, every farm has its pit from which the chalk has been dug to marl the fields. In our own country the most thorough marling of the soil has been done in Eastern Virginia. The late Edmund Ruffin was the pioneer in this improvement in that State. His first experiment was made in 1818, on his farm on the James river, in Prince George county. His first field marled contained fifteen acres, but by 1821 he had increased it to eighty acres, and in a few years it was extended over his whole farm of 600 acres. The result was marvellous, and soon had the effect of stimulating others to engage in the work, until the practice became general throughout all that part of the State where marl was found. In all cases where a judicious rotation was followed the crops were quadrupled and the land put in a course of permanent improvement. Its first and most marked effect was in causing clover to grow where none could be raised before, thus preparing the way for the growth of other crops. Mr. Ruffin's essay on Calcareous Manures is a standard work on the subject, and has been of incalculable benefit to agriculture.

The Miami and other soils in Ohio and those of other Western States, which are famed for their inexhaustible fertility, contain a considerable percentage of fine carbonate of lime, like these shell marls. And the spots along the shore of New Jersey, from Jersey City to Cape May, where the Indians had their fires for roasting clams and oysters, and where the fragments of shells

still remain in the soil, retain their fertility, though some of them have been cropped for more than 200 years. The widest experience has proved beyond question that such shells and shell marls are good fertilizers, both for enriching the soil and for furnishing a proper basis in the soil upon which to apply other manures.

Descriptions of the calcareous marls found in the Middle and Southern counties were given in the report of this board last year.

In the present report it is proposed to give descriptions of deposits in Sussex and Warren counties, with such accounts of their composition and uses as may help to make them better known and more justly appreciated.

WILLIAMS' FARM, VERNON TOWNSHIP, SUSSEX COUNTY.

This locality is three miles south of Vernon, and on the east of the Snufftown road, on lands of J. A. Williams. The meadow is about a quarter of a mile long and not more than sixty rods wide. It was discovered in ditching and was found two to three feet under the black muck. Where tested it was nine feet thick. The upper part is mixed with the muck and traversed by grass roots. The deeper mass is more shelly and pure marl; it is ash grey when freshly dug, growing white on exposure. The muck of this meadow has been used in compost with barnyard manure, and with good results. The little marl taken out in ditching the meadow has been tried by J. A. Williams on potatoes in the hill, and also on grass. It showed in the increased crop of grass.

This locality is in the gneissic rock country and there are no limestone outcrops near it. They may be concealed by these beds of marl and muck, and the boulder drift. The deposit is quite wet, owing to springs about it, but it can be dried by ditching, and the marl ought to be valuable in the neighborhood for enriching the soils on this *grey* rock (gneissic) formation.

BLACK CREEK MEADOWS, VERNON TOWNSHIP.

Shell marl has been found in the meadows, near Wm. Campbell's, west of Vernon, in Vernon township. It is covered by

black muck. This deposit, if equal to the area of muck-covered meadow, is one of the largest in the State. A little of the marl has been dug here and used, but the locality is so wet that its extraction is difficult and costly.

ROE POND, VERNON TOWNSHIP.

This pond is in Vernon township, one mile south of North Vernon or Glenwood, and on the top of Pochuck Mountain. It is four hundred feet above the Wallkill, into which its outlet brook empties through Pochuck creek. There is a dam at the outlet on the north, which holds back the water as a reservoir for the supply of the mills on the outlet brook. This sheet of water lies in a northeast and southwest depression of the gneissic rocks. No limestone outcrops are nearer than the white crystalline rocks in Glenwood, a mile to the north, although there may be some strata in the bottom of this depression, covered by the drift earth. The white marl is found in the low ground bordering the pond, and is covered by black peaty earth, which is on an average, a foot thick. The depth of the marl was not ascertained. J. S. Carpenter digs it near the dam; this work is done when the water is out, and it is let out in late summer to allow the digging. Small pits are dug, and the wet mass is wheeled in barrows to the shore, where it is left to dry. Freshly dug it holds a large amount of water; shells are abundant in it. Grass roots and fine, fibrous rootlets of water plants run through the upper portion of the deposit.

An analysis of a sample received from Mr. Carpenter, gave 69.10 per cent. of carbonate of lime, 2.26 per cent. carbonate of magnesia, 12.00 per cent. of sand and clay, 15.74 per cent. of water and organic matter, 0.20 per cent. of potash, 0.60 per cent. of ammonia, and traces of phosphoric acid.

Mr. Carpenter has used this marl with good results. (See letter from him further on in this report.)

ROE'S MEADOWS, NEAR BRANCHVILLE, SUSSEX COUNTY.

A deposit of shell marl was discovered in ditching a meadow of Nathaniel Roe, three-fourths of a mile east of Branchville. It is found on the adjoining lands of Jesse G. Roe. Where tested

it was found to be five to six feet thick, and barely covered by muck. There was a pond here formerly, now it is pasture meadow. Mr. J. Roe has used a little of the marl on his ground and noticed slight benefits therefrom.

This marl occurs in the meadows, east of North Church and northwest of Franklin Furnace. It also occurs near the Mud Pond on the Fowler estate, and one mile northwest of Ogdensburg. Some of it used as a fertilizer is said to have been injurious to the crop for which it was used.

LANE'S POND.

In the valley known as German Flats, Sparta township, shell marl occurs at several points. On the shore of Lane's Pond and on the bottom near the water's edge, the shells, which are common in the marl, and characteristic of it, are found and there is a thin sheet of the marly material under a light covering of black mud. But there does not seem to be any accumulation of workable extent. The formation here may have just begun, or the conditions favoring the accumulation of shell material may have been in part wanting.

WHITE POND.

This is the largest of the chain of ponds, and a very pretty sheet of water. Its elevation above tide level is about six hundred and thirty feet, and it has an area estimated at forty acres. The white, shelly and marly shore give name to it. The whole valley or flat is modified drift and this pond lies in one of the depressions in this drift formation. There are many boulders and cobblestones on its shores, but these have come from the clearing of the adjoining flat. The slopes to the pond are quite steep, but smooth, and nearly everywhere under cultivation. The water has the greatest depth near the outlet, at the northeast end of the pond. Judging from the contour of the surrounding land, it is estimated to be fifty feet. Much of the southern half of the pond is quite shallow, and the white, marly bottom is seen some distance out from the shore line. This lakelet is fed by springs, and its summer level is sometimes three feet less than that of the winter season. This lowering of the water

lays bare a considerable belt of marl. By cutting down the outlet between this pond and the next (Mud) pond down the valley, much of its southern part could be made dry and the marl there could be got out easily and readily. The shore is quite covered with numberless minute, whole and broken shells; these diminish rapidly downwards in the marl until it becomes a compact, homogenous mass. A specimen from one foot down, and under the water level of the winter season, was found to contain 93.00 per cent. of carbonate of lime, 1.47 per cent. of carbonate of magnesia, 0.71 per cent. of matters insoluble in acid (sand), and 4.82 per cent. of water, vegetable matter, &c

As the Sussex railroad is on the westside of this valley, about half a mile from the pond, the deposit could be worked for the supply of any outside demand. It is not known that any of the marl of this pond has ever been fairly tested as a fertilizer.

In the valley, one mile southwest of White Pond, and west of House's Corner, the shells are seen in the ditch bank in the meadow south of the Lafayette road. They indicate the existence of marl deeper, under the black meadow soil. The late Robert B. Washer dug in this meadow, about five years ago, and used the marl from it upon his farm towards Sparta. It was applied on oat-stubble ground, which was seeded with rye. It showed no particular benefit in this crop, but the grass since that time has been much heavier upon the part of the field which was marled.

THE PAULINSKILL MEADOWS, NEAR NEWTON,

Are said to have shell marl in them, but quite deeply covered by muck. As they are very wet, the extraction of the marl would not at present be practicable unless it was done by a dredge. If much of the meadow is a marl basin, this deposit is very large.

DRAKE POND.

This little pond is one mile south of Newton, and is one of the sources of the Paulinskill. The area of the pond and the marly shore is estimated to be eight acres, and its greatest depth thirty-six feet. The deposit appears on all sides, and extends some

distance into the water, beyond which limit the bottom falls off steeply. In deepening the outlet the past summer this cut went down several feet into the marl and did not reach the bottom of the deposit. It could be lowered ten or twelve feet more and thereby a wider belt of the marl be laid bare, so as to become dry and workable throughout the year. G. W. Drake, the owner of the pond, has dug the marl on the southeast side of the pond and used it on his farm. The surface marl contains some shells; that lower down is solid and compact. It contains 96.54 per cent. of the carbonate of lime, 1.47 per cent. of carbonate of magnesia, 2.05 per cent. of sand and clay and vegetable matter.

The Sussex railroad track crosses the outlet and runs at the west side of the pond, so that the deposit can be worked for other supplies than those of the immediate neighborhood. In this respect, this locality has advantages over all others in the State.

Southwest of Newton there are several ponds and wet basins in which shell marl may yet be discovered. Their location and surrounding conditions appear to make its existence in them very highly probable. The larger of these are Stickles, Grass and the Muckshaw ponds

PIKE OR WHITE POND.

This pond is about one mile north of Andover, and on the east side of the road leading from that place to Newton. There is a broad belt of marshy ground on the west side of it, in which also the marl occurs. The pond area was once much larger, occupying the site of this wet border. S. R. White of Andover, and James A. Goodale of Dover, own the pond and adjacent land. The principal part of the deposit is said to be on the east and southeast of the pond. It is cut in the ditches in the marsh on the west at one to two feet under the surface. The top marl is a mass of small shells and calcareous material mixed with some organic matter derived from the roots of the peaty mosses and shrubbery above it. Owing to the wet condition of this meadow and the water on the marl in the pond, it is at present difficult to get it out, excepting in the winter when the marsh is frozen and able to bear sleds and teams. Lowering the water is also almost impossible. As at Drake pond, dredging might be done. The deposit is a large one, and has the advantage of nearness to rail-

road, as the Sussex railroad line is not more than a quarter of a mile east of the pond. The marl of this deposit has been used by James A. Goodale and by S. R. White. For their results see their letters following these local descriptions.

DECKER'S POND, NEAR ANDOVER, SUSSEX COUNTY.

This deposit of shell marl is one mile southwest of Andover, Sussex county. It lies in the valley of Trout brook, a tributary of the Pequest river, and between the gneissic and crystalline limestone rocks of the Highland range on the east, and the blue, magnesian limestone on the west. In the lower part of the valley, the rocks are covered by stratified beds of sand and gravel and blue clay. A terrace level is traceable along the west side of the stream. Sink holes and little pond holes are seen upon it. Upon this terrace formation the marl rests, occupying a narrow belt around the pond, and along the brook south of it nearly to J. J. Decker's residence. In one of the sink holes Mr. Decker dug through:

(1) Muck.....	1 foot
(2) Earth and fine gravel.....	1½ feet
(3) Sandy clay	3 feet
(4) Black sand and gravel at the bottom.	

The top of the terrace is at least 20 feet above the pond level and the lower flat. The marl is mainly in three irregular shaped deposits, connected by a narrow strip along the brook. The northernmost is that about and under the waters of the pond. Here the marl is covered by a thin deposit of peaty earth, and by the water of the pond in its more shallow parts. There is more muck on the marl of this portion of the deposit than on that further south. The surface is wet and miry, excepting in very dry seasons. The pond is estimated to be 30 feet deep, and marl forms the bottom of all the more shallow portion. The farms of Mrs. Andrew J. Mapes and Jas. Van Syckel share this pond and its enclosing marl deposit. When visited last September the water was unusually low, and had receded several rods from the ordinary shore line and left a considerable area of marly surface dry on the east and north.

South of the pond there are two connected bodies of the marl,

each occupying an area of five acres, more or less. That nearest the pond is covered by black muck, and this overlying bed appears to be thicker near the border of the meadow and the marl deposit than it is in the middle and along the central, or outlet ditch. Thus the side ditches, two feet in depth, did not strike the marl in some places on account of the thickness of the top muck, whereas in the outlet, or main ditch, it was cut all along its course. The southern division, or body, of this marl deposit lacks the usual muck, or peaty earth covering, and it forms the soil in that part of the meadow. Borings made recently by Sayre & Co., of Newark, are said to have found a maximum thickness of twenty feet. The soil is white and supports a medium crop of natural meadow grasses.

The Parnassia Caroliniana, or grass of Parnassus, is a characteristic plant on these marl soils. In the upper portion of the deposit shell forms are recognizable, and among these *Planorbis* abounds. A species of a *Limnea* is also common. Lower down these disappear, and the marl is more solid. When freshly dug it is greyish white. After drying it is white and looks like chalk. An analysis of an average of that between one and two feet beneath the surface indicates the following percentages: Carbonate of lime, 98.33; magnesia, traces; sand and clay, 0.90; and water, vegetable matter, &c., 0.67.

The southern portion of this deposit is on the lands of Job J. Decker. Some trials of the marl as a fertilizer have been made by Mr. Decker, but with unsatisfactory or indecisive results. That which was mixed with muck, and from the side ditches, was put on a gravelly loam soil and by the side of the barn yard manure. It showed quite as well as the latter in the increased crop. Other trials of the marl alone made by neighbors of Mr. Decker have not given like good results. They appeared to show that it was inert.

Further down the valley of Trout Brook and one mile from Decker's place, a marl is reported as occurring on lands of Wm. Wolf. It has not been tested in any way.

REDING'S POND, GREEN TOWNSHIP, SUSSEX COUNTY.

South of this pond and along its outlet brook there is a long stretch of meadow, much of the surface of which is very fine black

muck. And this lies upon a bed of shell marl. From the surface indications there appears to be an area of several acres in this deposit. It is on the farms of J. Collins Drake and Joseph Ayres.

JOHN H. AYERS' MEADOWS NEAR GREENVILLE.

This deposit occupies the site of an old pond. It is a quarter of a mile southeast of Lincoln or Greenville, and on the north side of the Tranquility road. It is cut in the ditches of the meadow under a layer of black earth two feet thick. Marl could be got here easily, and at almost all times of the year. The little which came out of the ditches was spread last fall upon land about to be put in grass.

LONG POND, JACOB VASS' FARM.

Three-eighths of a mile south-southeast of Lincoln and in Green township. This is a small basin partially shut in by rocky limestone *cobbles* or knobs, and without any visible inlet or outlet. It dries up in the summer. The marl deposit is about fifty rods long and ten rods in width. On it there is a very thin layer of muck. A specimen one to one and a half feet below the surface of the marl was analyzed. It contained 97.05 per cent. of carbonate of lime, 1.68 per cent. of carbonate of magnesia, 0.55 per cent. of sand and clay, and 0.82 per cent. of oxide of iron, water: vegetable matters, &c., undetermined.

Some of this marl used on the Vass farm is reported to have been inert and worthless as a fertilizer. Marl occurs in the meadows near the farm house on the same property.

SINK POND,

On the farm of Theodore Longcor, in Frelinghuysen township, Warren county, and less than half a mile southwest of Lincoln. As its name indicates, it *sinks* away in the summer, and becomes dry enough to support a growth of cat-tails and other aquatic plants. In very dry weather the water disappears. The extent of the marl deposit is estimated to be 5 to 7 acres. It has neither inlet nor outlet. The surface is a black muck for a foot or so in depth, covering the marl. The latter is yellowish-white, quite

dense, and contains few whole shells. Analysis of a representative specimen of the top marl showed 90.18 per cent. of carbonate of lime, 9.75 sand and clay; magnesia, oxide of iron and alumina, &c., undetermined. The deposit has not been worked. During the summer and autumn it is dry, so that it can then be easily taken out.

HAZEN POND.

This pond also is on the Longcor farm. It lies west of the Greenville and Johnsonsburg road, and not far from the farm house. There is no outlet, and the surrounding ground is very wet—swampy. The marl is said to be deeply covered in this swampy border, and to form the bottom of the pond. None of it was seen, and of its use nothing was learned. It could not be dug unless in winter, and then the water might prove troublesome.

GRASS POND.

This marl locality is on the farm of Levi Howell, one mile south of Hunt's mills, and in Green township. Much of it is dry throughout a greater part of the year, and is, as its name intimates, a wild-grass depression rather than a pond. The area is said to be between 30 and 40 acres. The bottom of the more wet portion is marl. Elsewhere there is the muck covering. Daniel W. Howell, now residing on the farm, says that he has dug five feet into the marl. The outlet could be lowered so as to leave the deposit dry enough to work all, or nearly all, the year. A specimen received from Mr. Howell was analyzed. It had 96.32 per cent. of carbonate of lime, 1.57 per cent. of carbonate of magnesia, and 1.16 per cent of sand and clay. The experiments with this marl have been rather indecisive. A small amount of it was used on the farm several years ago, and was found to make the clover grow better and stay green.

COOK POND, NEAR JOHNSONSBURG, WARREN COUNTY.

Shell marl is found in this pond, one and a half miles northeast of Johnsonsburg, and in the narrow meadow between the

pond and that village. The depression, or valley, near the head of which the pond is situated, is a mile in length, from northeast to southwest, and nowhere more than forty rods wide. The meadow is wet, and covered by wild grasses and aquatic plants, with scattering clumps of bushes. Its area is not less than 50 acres; that of the pond is about 10 acres. The water throughout a great part of the pond is shallow, and covers the yellowish-white marl of the bottom. The ground immediately around it is very wet and miry, so that access to the marl deposit is not easy, unless by using a boat or when the surface is frozen in winter. The outlet brook, running lengthwise of the meadow, might be lowered somewhat, provided the demand for the marl warranted such an outlay. The owners of this wet tract are Levi Lanning and the Daniel Cook estate on the northeast and William F. B. Howell on the southwest. The deposit appears to be large, and equal to all local demands upon it.

Shell marl is reported on the farm of A. W. Cook, three-quarters of a mile west of Johnsonsburg. It was discovered in ditching a muck swamp, which has lately been made into meadow.

GLOVER'S POND, ONE MILE SOUTHWEST OF JOHNSONSBURG.

Marl appears on the east shore and on the bottom of this pond. The area of the latter is estimated to be 50 acres, and its depth is about 30 feet. At the head, and also about the outlet, it has not been seen. The black mud seems to be deep along the outlet, on the southwest side of the pond. None of the marl has been tested as a fertilizer. It is not easily reached, except by letting out the water of the pond. The land owners are J. W. Vosbinder, at the southwest; Robert Blair, southeastern and the marl shore; and D. G. Van Horn and John Gibbs' heirs, on the northeast.

LUSE POND,

Near the northeast end of Jenny Jump mountain and south of Glover's pond, is another reported locality where shell marl occurs. It was not visited.

LONG POND, NEAR HOWARD, FRELINGHUYSEN TOWNSHIP.

This is one of the smallest of the shell marl basins, its area not being over three acres, if so large. It is half a mile east of the Hope and Johnsonsburg road. It has no outlet, and becomes dry in the summer. There is an average thickness of a foot, or one spit, of muck at the top; then the yellowish white marl containing numerous shells. These decrease deeper in the marl and it becomes more solid. Mr. Cooke, one of the owners, says that in places the deposit is 20 feet thick.

Analyses of the top spit and of that one and a half or two feet deep show that the top marl contains 95.34 per cent. of the carbonate of lime, 2.18 per cent. of the carbonate of magnesia, and 0.98 per cent. of sand and clay. The deeper spit contained 97.73 per cent. of carbonate of lime, and 0.60 per cent. of sand and clay. The owners of this marl are Abr. M. Cooke, L. J. Howell and J. Wesley Pierson. The experiments with the marl got here are recorded in the letters following these local details.

HOPE MEADOWS.

Shell marl occurs in the meadows west and northwest of the village of Hope, and on lands of Geo. H. Beatty. There is in this meadow tract nearly one hundred acres, whose surface is a fine, black peaty earth. The ditches draining this tract cut through three feet or so of this material, and reach the marl at the bottom. Excepting the small quantities thus taken out of these ditches the marl is not dug.

COOK'S OR REED POND.

On the farms of Henry S. Cook and John Hendershot, in the southeastern corner of Blairstown township, and two and a half miles north of Hope. The pond covers three to four acres. On the southwest end and along the southeast side there is a narrow border of swampy ground and wet meadow. In this the marl is close to the surface, particularly on the southeast side of the pond, being covered by a few inches of muck. Its surface here is one to two feet above the summer level of the pond. The top spit is quite full of shells and grassy roots; deeper it is more

homogenous and compact. Analysis indicates 89.87 per cent. of carbonate of lime, 2.29 per cent. of carbonate of magnesia, 0.97 per cent. of sand and clay, and 6.87 per cent. of water, vegetable matters, &c., not determined. H. S. Cook has dug a few small pits on the southeast side of the pond, and used the marl on his farm with good results. This deposit is not so wet as to be inaccessible, and by lowering the level of the pond it could be worked throughout the year.

Marl is reported as occurring in the meadows northeast of Cook's Pond, and near the M. E. Church.

MT. HERMAN, WARREN COUNTY.

This deposit is in a swamp about two acres in extent, near Samuel Read's place. It is ten to twelve feet in depth, and under two to three feet of muck. Limestone hills surround the swamp. The marl is light drab colored and contains specimens of *Cyclas* and *Planorbis*; it has not been used. (Specimen with above notes from Samuel Read, of Mt. Herman).

GEORGE CARTER'S MEADOWS, NEAR BLAIRSTOWN.

A shell marl has been thrown out of ditches in a meadow along the Cedar Lake or Buttermilk Pond outlet brook, south of the Paulinskill, and near Blairstown. The meadow in which it has been discovered has an area of eight to ten acres, and it appears to be a marl basin throughout this extent. The surface layer is black muck two feet and upwards thick. This covers the marl, and the ditches do not everywhere get below this muck layer. The marl has not been considered valuable as a fertilizer and has not been tested. A short distance west of this meadow, marl and muck are seen in a small storage pond just below the Cedar Lake. The depth of muck here is considerable, and shells appear scattered in it, as if it were a mixed material. This muck has been used by Mr. Carter and with very satisfactory results. The marl in the meadows and in this pond can be dug without much inconvenience from water, and the deposit appears to be adequate to all local demands for this fertilizer.

WHITE POND.

Shell marl very appropriately gives name to this most beautiful sheet of water. It is one mile north of Marksboro, in Hardwick township, and is the largest of the so-called *white ponds* in the State. Its area has been estimated to be 100 acres. The water for several rods from the shore on the south and west shores is shallow, then it deepens on a steeply sloping bottom to a mean depth of 35 feet. The north and northeast shores are bolder and the water deep along the shore. The white marl appears at the bottom in all of the more shallow parts and in the marsh and meadow around the southern and eastern sides. It makes the meadow surface over an area of several acres, on the southeast and near the outlet brook, and is above the level of the water of the pond. On the west side the mud is deeper, and is supposed to be underlaid by marl. At the southwest there is an old beaver dam which partially shuts off several acres in a little cove and quite separate from the pond basin. The marl in this dam indicates its existence underneath in this part of the meadow. The total area of marsh and meadow surrounding the pond cannot be less than 30 acres. There is a tradition that the most of this meadow and wet border was once covered by the waters of the pond. This diminution in the size of the pond is very probable and the accumulation of marl and the growth of peaty material may easily account for it. The characteristic *marl flower*, grass of Parnassus (*Parnassia Carolinensis*), appears here growing on the marly surface. The thickness of this bed, or deposit, is in places 10 feet. In the pond it is probably much thicker. The outlet brook flows southeast, emptying into the Paulinskill. It becomes dry in the summer. The outlet could be deepened and the pond level lowered considerably, and a large body of marl be left dry were it ever necessary to get much of it out. But there is a large body of marl on the southeast shore, which is at all seasons of the year accessible. A few small pits have been dug there, and some of the marl put on the adjoining land. The surface, or top marl, is quite shelly for six inches down, then it grows more dense. A specimen from two feet down gave on analysis 92.25 per cent. of carbonate of lime, 2.98 per cent. of carbonate of magnesia, 1.56 per cent. of sand and clay, and 3.21 per cent. of water, vegetable matters, &c., undetermined. The

shore on this side of the pond is a mass of shells, most of them still unbroken. The *Planorbis* abounds. The land owners about the pond are Phillip W. Squier, and J. S. Vass on the west, George Primrose on the northeast, and Isaac Vough, Wm. C. Wildrick and J. C. Van Horn on the east and southeast.

MUD POND AND SHUSTER POND,

North of White pond and near the county line are also said to contain shell marl. They were not visited. Its existence in them is highly probable.

CATFISH POND.

This pond is one mile west of Stillwater and in Sussex county. It has no visible outlet and dries up in very dry seasons. It covers five to seven acres. Even in the summer when the water has disappeared, the marly bottom is quite wet, and the locality is not as accessible as many others for getting marl. Some experiments with this marl by Mr. Shafer at Stillwater, are reported to have been unfavorable to the further use of it as a fertilizer.

ISAAC BONNEL'S MEADOWS, MONTAGUE TOWNSHIP, SUSSEX COUNTY.

This is one of the largest deposits of shell marl in the State, occupying a meadow 75 acres in extent. There is a tradition that when this country was first settled by the whites a pond covered the flat now in meadow, shut in by a beaver dam near Mr. Bonnel's residence. The deepening of the outlet and ditching have drained off the water and most of this area is now good pasture ground. Towards the southeast it is still wet and full of bogs. Dr. Kitchell, State Geologist in 1854-6, tested this marl deposit by borings. The results of his work as given in his report for 1854, p. 48, and reprinted in the "Geology of New Jersey," p. 171, showed near the centre of the deposit the following section :

- "(1) Peat and muck..... 3 feet.
- (2) Marl and peat, containing live testacea..... 4 feet.
- (3) Marl, very fine, made up of decomposed shells..... 11 feet.

The instrument not being of sufficient length, the whole thickness of the deposit was not ascertained. In other places where the examinations were made, the peat was found to be from 5 to 10 feet in thickness; and from 6 to 10 feet from the surface were found imbedded the branches and trunks of trees from 1 to 2 feet in diameter." Near the farm house the overlying black earth is only about a foot thick. And there the top marl is ash grey color and contains some roots and imbedded plant remains. An analysis of a specimen from the surface gave the following results: Carbonate of lime, 66.81 per cent.; carbonate of magnesia, 1.14 per cent.; sand and clay, 23.99 per cent.; water, vegetable matters, &c., 8.16 per cent.

Marl was discovered by Dr. Kitchell's assistants on lands then owned by J. Cole, about two miles southeast of Montague, or the Brick House, and near the Hainesville road. According to the report above cited, "the peat resting upon the marl is from 4 to 6 feet thick and the marl from 6 to 8 feet, resting upon a bed of sand and gravel."

South of the last mentioned locality marl occurs in meadows belonging to Jas. Bevans, one mile north of Hainesville, and on the west side of the Hainesville and Montague road. The place was formerly owned by Samuel Clark and Isaiah Van Etten. The above mentioned report says that there is an area of 20 acres of marl, overlaid by a deposit of peat three to eight feet thick. Mr. Clark further states that none of this marl has been dug, excepting what is thrown out in ditching the meadow. This meadow is quite dry and no water runs out of it in dry summer weather. It would be a convenient locality to get marl, if it were wanted.

LAYTON'S MEADOW, WEST OF CENTREVILLE, SANDISTON TOWNSHIP.

This is another marl meadow. It is owned by Francis and Stewart Layton, and is not more than a quarter of a mile west of the Layton Post Office. The meadow has an area of 10 or 15 acres, and the whole of it is thought to be underlaid by marl. Several lines of ditches cut the overlying muck and *bottom* in places in the marl. The former is found to be, generally, 1 or 2 feet thick. Mr. Layton estimates the marl to be 10 feet thick in the deeper portions of the deposit. The outlet brook, which flows east-southeast towards the village, could, at a moderate ex-

pense, be cut down, and the marl be dried and more easily and conveniently reached. An analysis of a specimen from the bottom of one of the ditches gave 61.48 per cent. of carbonate of lime, traces of magnesia, 16.21 per cent of sand and clay, and 16.59 per cent. of water, vegetable matter, &c., (unweighed). A very little of this marl has been used by the Messrs. Layton. Their experience with it is given in an accompanying letter.

Less than a quarter of a mile west of Layton's there is a meadow very similarly situated, and marl is reported in it.

BEVANS AND SMITH MEADOW, NEAR PETERS' VALLEY.

This locality is three-quarters of a mile north of Peters' valley, and at the side of the Dingman's Ferry road. Its area is about eight acres. Parts of it are very wet, and the muck covering the marl is 1 or 2 feet thick. As there has not been any digging, or exploration here, except in ditching, the thickness of the deposit is unknown. The outlet could be lowered and the marl better drained, if it were needed. Some of it from these ditches, but mixed with muck, was put on corn in the hill on a clay loam soil near the river, and was reported to have done good to that crop. That application was about 20 years ago. The ground then marled is said to retain the benefits from that dose.

CALCAREOUS TUFA, TRAVERTIN.

There are two deposits of this material in the State, both of which are in Sandiston township. These differ from the shell marls in the manner of their deposition. The latter are largely, if not altogether, the accumulated remains of the small mollusca remains; the former are chemical precipitates, or deposits of calcareous matter from the waters of springs and underground streams. Water highly charged with carbonic acid gas has the power of dissolving carbonate of lime with other inorganic constituents of rocks. These coming to the surface and losing a portion of the carbonic acid cannot longer keep these materials in solution. They are, in consequence, deposited as carbonates of lime, &c.

BENJAMIN VAN SYCKEL'S MARL.

This locality is less than a half a mile east-northeast of Peters Valley. The following description by Dr. Kitchell, "Geology of New Jersey," page 172, is still pertinent.

"On the farm of Mr. Benjamin P. Van Syckle, in Sandiston township, three miles northwest of Tuttle's Corner, and two miles southeast of Dingman's Ferry, is found a deposit of calcareous sinter, covering an area of at least five acres. It is exposed on either side of a small stream to the depth of several feet. A well, fifteen feet, has been dug into it without passing through its whole extent. Though very hard and compact upon the surface, it becomes softer and more pulverulent as it descends. In it are found numerous nodules, or concretionary masses, which have been formed by the deposition of the lime around a twig, or some other substance, as a nucleus for the aggregation of calcareous particles. The source of this deposit may be traced to a spring half a mile distant, near the house of Mr. James Struble. This spring issues from the base of a limestone ridge, and empties into a small reservoir or pond, whence it passes to Mr. Van Syckle's land. In the bottom of this reservoir grows the chara, a genus of aquatic plants. While growing at the bottom of ponds and streams, it has a dark-green color, but upon being removed and exposed directly to the atmosphere, it soon becomes white and crumbles to a fine powder, composed chiefly of the carbonate of lime. Large quantities of it are constantly forming at the bottom of this pond, and it requires to be removed, from time to time, in order to prevent the pond from being filled by its rapid accumulation."

The spring referred to above is extraordinarily large and a good sized stream flows constantly from it. At present it is owned by heirs of J. Schooley. The deposit makes the surface of an acre or more of one of Mr. Van Syckel's garden lots and it is a very productive soil and noted specially for the crops of excellent potatoes, turnips, &c., grown on it.

METTLER'S MARL.

This is near the river at Dingman's Ferry. This deposit comes from the waters of a large spring above the farm house and on

the hill slope. From that it stretches down the hill about 70 rods to the bank of the river. It may average 50 yards in width. It is said to be 15 to 25 feet thick. The surface portion, exposed to the atmosphere is quite hard and stony in appearance. The deeper portions are said to be soft and earthy. Very fine and sharply-defined leaf impressions as well as stems and branches of trees, are found quite abundantly in it. These are caused by the deposit of calcareous material upon leaves and about twigs, &c. The subsequent decay of these organic forms and the hardening of the incrusting material leave the forms preserved in the stony matrix. An analysis of the softer, yellowish, calcareous portion of the deposit, made by the Geological Survey and printed in the "Geology of New Jersey," page 480, is as follows:

Lime	50.79
Magnesia	0.44
Carbonic acid.....	40.37
Oxide of iron and alumina.....	6.50
Quartz	0.93
Water	0.80
Total.....	99.83

It has not been used as marl. The more stony masses could be very readily taken out, more easily than quarrying limestone, and burned into lime. It ought to make an excellent lime for both mason's uses and for agriculture. This deposit is so conveniently located for working all the year round and the material so pure that it seems as if it should be utilized for the benefit of the farms of the surrounding country.

LETTERS ON THE USE OF MARL.

H. S. COOK, OF BLAIRSTOWN TOWNSHIP, WARREN COUNTY,

Writes, "Yours of the 5th is at hand, asking for information about white, or shell marl. I hauled in August, 1870, twenty loads on a lot of four acres, covering about one acre with the marl. The lot had corn on it the year before, and had been ploughed twice that fallow before hauling the marl on it, (this is what we call fallow.) Sowed it with wheat and rye and timothy; could see a difference, being the best where the marl was put on;

have mowed the timothy every season since; it was twice as good where the marl was put as on the other part. Last spring (1877) I ploughed it up and had corn there, the corn was best where the marl was put. In November, 1870, I hauled, perhaps, 100 loads on a field in the poorest state of cultivation on the farm. It had been ploughed in fifteen-pace lands, which left a ridge and middle furrow to a land seven and a half yards apart. A row of heaps of marl was put on each of these, the heaps being rather closer in the rows than the latter were. I think a load of marl made eight or nine heaps, being very heavy as taken out of the bed. There was some black muck on part of that we hauled out. It went with the marl. The field has nine acres. Seven acres of it was covered by the marl, which was spread the next summer (1871). The field was full of sorrel (red with it) that season. The next season (1872) I ploughed it up for corn and had a first rate crop, better than we had in another field of the same size and in a better state of cultivation. Where we put the marl there is no sorrel; adjoining it there is yet plenty of it. In 1873 the field was in fallow. In the fall it was sowed with wheat and rye; had a first rate crop of each the next harvest (1874); sowed it with clover in the spring of 1875; it wintered out; in the spring of 1876 ploughed it up for corn, and had a good crop; fallow the next season (1877) and then sowed with rye and wheat. They look fine.

"I think that the marl should be hauled, or thrown out and left out, on dry land perhaps a year, to freeze and dry out, although that which I hauled in August got dry enough to spread by the time we wanted to put in the grain. We have been using lime, from 20 to 25 bushels in the stone, to the acre, with benefit. We think the marl answers the same purpose.

"Where the marl has lain in heaps I have seen bare spots where the grass did not grow. I suppose it was too strong, but it did not do any hurt worth naming. Where the muck was with the marl (perhaps one-fourth muck) I see no bare spots.

"The land through here is mostly slate and rolling, with some loose stone, enough for a fence two rails high to 10-acre fields. Between the hills we have level meadows. We do not plough up our meadow lands but mow them every year, depending on them for our hay."

HON. ISAAC BONNELL OF MONTAGUE, SUSSEX COUNTY,

Writes, "Your favor of the 5th, asking information in regard to the white, or shell marl, is received. I can merely say that I have used it and found it to be of great benefit. I spread it on the ground after it is plowed and when ready for sowing, or planting, so as to cover the ground about half an inch thick. When rye or wheat is sowed the ground is harrowed over as usual. For corn I put one handful in the hill and cover it up with the corn, or the same quantity is put on the hills of corn after planting. Wherever I have used it I can see the good effects of it in grass where it was applied five years ago. Then again I have drawn it out in heaps and let it lay in that condition some time, then spread it out quite thick. But I have not used as much as I would, on account of my soil being on limestone. I have sold some, which was mixed with muck and used on a sandy soil with very good effect in producing vegetables, as onions, potatoes, cabbage, and all kinds of garden truck. And it has succeeded so well that they are wanting more of it."

J. S. CARPENTER, GLENWOOD, VERNON TOWNSHIP, SUSSEX COUNTY,

Writes, "The marl I use is a formation of shells found at the bottom of a lake, which is covered with water most of the year, but in a dry time when the water is drained off for milling purposes it can be shoveled out from the shore. It is then too sticky to spread and very heavy to haul. I therefore pile it and let it dry, and in the fall draw it on the meadows and fields, which I intend plowing in the spring for corn, using half as much marl to the acre as I would manure. Marl should be exposed to winter freezing on the ground. In the spring I go over the mowing meadows with a brush, pulverizing it as fine as ashes. When I first used it I supposed it would take more than manure and *killed* the ground for two years, but afterwards had fine crops and as large timothy as I ever saw. I used it on a field, half of which was producing a good crop of hay; the other part was lower land and not yielding much and covered some with moss. I applied marl in the fall, brushed it in the spring, and gathered as much hay as from the part where it was not applied. The following spring I plowed it for corn, having a fine crop, and then oats and wheat.

The clover on the low part was as good as on the fine upland. Last summer I had oats on a field where marl and manure were applied; the part where marl was used stayed green seven days longer than the other and was larger. Many remarked 'how uneven your oats are ripening.' The fall was very dry, and the part of the field marled, plowed like an ash pile; the other was so hard as to break in clods—both the same kind of land.

"This marl is very much like lime. I use my manure for the low meadows and marl for the upland."

Mr. Carpenter's farm is underlaid by gneiss rock, and the soil, though of drift origin, is probably derived from that rock.

WILLIAM CAMPBELL, OF VERNON, SUSSEX COUNTY,

Writes, "Yours of the 11th at hand, in regard to shell marl. There is a small deposit here, but it has not been used to any extent. One reason is that it is very wet, and it would be difficult to get any amount of it out on account of the water. When used it has given good returns for the labor. I do not know anything as to the extent of the deposit—as so little has been taken out."

Of the *Williamsville* marl, E. H. Wright, of Stockholm, writes, "Mr. Richard S. Denton, of Vernon, says he used one hundred bushels of the Williamsville marl on bottom meadow grass lands in 1872, and saw no effect from it whatever. John A. Williams, says he has used about one thousand bushels on bottom meadow with very good effect. He thinks it equal to barnyard manure. He has also used it on upland, on potatoes, with equally good effects, and can still see the effects where he used it five years ago.

I give you their statements precisely as they gave them to me."

GEORGE H. BEATTY, OF HOPE, WARREN COUNTY,

Writes, "Your letter making inquiry about white or shell marl is received. I have not used much of it. What I have used was as a top dressing on meadow land and that showed good effect. Mixed with peat or muck in equal quantities and spread on

grass land in the fall, it increased the yield of hay about one-third. The same mixture did well on corn ground; it has done well on grape vines also. I expect to use some more the coming season on different kinds of grain, and thus further test it. I have no doubt it will, if fairly tested, prove a good fertilizer."

S. R. WHITE, OF ANDOVER, SUSSEX COUNTY,

Writes, "I regret that I cannot answer as I desire in regard to the value of the shell marl so abundant in many localities in this and adjoining neighborhoods. * * * * *

In regard to the shell marl *here*, can only state that the application of it has been limited to a few experiments, which from the manner applied, were not very satisfactory. One of the joint owners of Pike pond, one mile north of Andover, some years ago applied too much, say from 100 to 300 bushels per acre, which amount damaged the fertility of the land on which it was applied. But the same land has since become fertile again, but without any perceptible change. My father cotemporary with the above named experiment applied some marl on yellow clay and gravelly soil, in moderate quantity, and thought it benefited his land. Succeeding my father in the joint ownership of the above pond, I applied it a few years since, on clover sod, letting it remain two or three years; then when plowed I considered it beneficial. If slaked with fresh lime from the kiln, in quantity, say one-third lime and two-thirds marl, or in a compost of black muck and lime, I doubt not it would act favorably and be a good fertilizer."

JAS. A. GOODALE, OF DOVER, MORRIS COUNTY,

Writes, "In reply to yours of the 5th inst., I would say that I used the white or shell marl found on my farm, near Andover, Sussex county, (formerly belonging to Judge A. Davis), and could see no benefit from its use. I applied it on the grass field, about 50 bushels to the acre, also on a part of the same field, about 100 bushels to the acre. This was applied in the fall and plowed in the spring for corn. It certainly did no good, and we thought the corn not as good where it was put, although that part was as good as any part of the field. After seeding the ground we observed that the seed did not take as well on that part. I used

it on another field as a top dressing with no good result, and we observed when my man ploughed the field, that the ground where it had been applied about a year previous, was firmer and harder than elsewhere, but could see no good result. I also used it in the spring on corn ground. On part of the field I applied muck, on another part barn-yard manure, and on another part the marl. The good effects of the manure and muck were evident, but not of the marl.

“Being anixous to fairly test its virtues, having a large deposit on my farm, I induced several of my neighbors to give it a trial, among the number, Mr. A. Pudor, of Andover, he being a good and successful farmer, also a very close observer. He with the others, without exception, reported about the same result.

“In experimenting with it, I drove off the carbonic acid by the aid of heat, and had as a result, good quick lime, and come to the conclusion that to make it available as a fertilizer it would be necessary to press it in blocks, dry it thoroughly, and burn it.”

Mr. Goodale's farm is on limestone and slate rocks, and the soil is a mixture of the materials from those rocks.

JOSEPH AYERS, ANDOVER, SUSSEX COUNTY,

Writes, “Yours of the 10th received and contents noted. There are three beds of white, shell marl near me. I used about 100 bushels of it on corn and potatoes some years ago. I don't recollect particularly the results, but think it did some good. One man tried it about the same time on potatoes, and said that it doubled his crop. Since that no further trials of it, to my knowledge, have been made. Many years ago a Mr. Davis tried it on grass land, about 300 bushels to the acre. For a time nothing would grow there. It acted like an overdose of lime. When it came to, it produced more than ever before and the field is now, as I understand, the most productive on the farm, all having been treated alike since that trial of the marl. There are great quantities of the marl in all these beds. And I have no doubt it would be of value to our land, if we would use it right. That I used I hauled in the winter. It was very wet. I threw it in a heap. In the spring when dry it was very light and fine handling.” Mr. Ayres' soil is underlaid by limestone and slate and is itself probably a mixture of the two rocks.

THEO. F. YOUNG, OF BRIGHTON, SUSSEX COUNTY,

Writes, "There are several beds of marl in this county and two in this immediate neighborhood. Experiments have been made with marl from both of these localities by different parties in the neighborhood. I have not myself used any. So far as I can learn the experiments made have not satisfied the parties of the value of them.

"Lime is here abundant and cheap (10 cents per bushel) and is much used even in the immediate vicinity of the marl beds."

A. M. COOKE, HOPE, WARREN COUNTY,

Writes, "I received yours of the 5th inst., and in reply would say that my father used marl some forty years ago, putting it on heavy and killing the soil. Heavy rye straw would grow, but for seven or eight years it would not fill. He used other fertilizers all the time, and even now, in corn crops, it can be seen in spots. It made the ground baky and hard, and in dry seasons it would crack open. I have used it in other ways; I drew it out and let it lay two or three years before applying it to the soil, but it seemed to have the same effect, although I spread it on lightly. I also put a quantity of it on the top of a lime kiln and burned it, and I think it had about the same effect on the limestone soil as lime. I used it on corn and grass and it seemed to have the same effect as lime.

"It might have a better effect in other localities, but it has been used on limestone, sand and slate here and not met with much success."

P. W. SQUIER, NEAR MARKSBORO, HARDWICK TOWNSHIP, WARREN COUNTY,

Writes, "Yours of January 5th, received. In reply to your inquiry, will say, I have never used any marl of any description, nor have I ever seen any used. We have a small lake or pond, near me, that has something like a marl about it, but I have never used any of it. I believe some of the neighbors have, but with poor result; they said that it did not amount to anything. I think that they gave it a poor trial, and drew it out in a raw

state and ploughed it under right away. There has been some used for plastering lime kilns, where the limestone has been piled up to quite a height above the kiln, then the marl plastered all around on the outside and the kiln then burned. They say that it makes a very nice white substance like lime, and they think a good fertilizer."

JESSE G. ROE, BRANCHVILLE, SUSSEX COUNTY,

Writes, "Once in the fall, when clearing out a ditch along this marl, I drew out several loads of the muck and marl, just as it came from the ditch. It lay unspread until spring, then I noticed around the heap that the grass sprung up quicker and looked much greener. The ground was ploughed that spring, but I saw no further effects from it.

A friend from Tioga county to whom I showed this marl said that where he lived lime was very scarce. Some one found a bed like mine; they moulded it somewhat like brick, dried it, then placed it in a kiln and burned it. It passed off as a good lime and was called 'swamp lime.'

The marl is found on the farm of the late Nathaniel Roe, but I do not know that he ever applied any of it to his land. I remember hearing him say that he thought lime did not do much good."

B. P VAN SYCKLE, OF PETERS VALLEY, SUSSEX COUNTY,

Writes, "We hasten to answer your note of the 5th instant. In reply we regret to say that so far our experimental knowledge in regard to the value of our marl as a fertilizer has been quite limited. Our land in this valley is mostly lime, or what we call lime land, therefore we have come to the conclusion that it would be more beneficial to apply this marl on land which is deficient in that article. One of our neighbors used several tons on a field adjoining our place. Unfortunately they applied an overdose, which seemed to have the same effect as an overdose of lime. It stopped the growth of vegetation for several years, but it has regained its normal state of fertility. This circumstance discouraged our neighbors, for the time being, in the use of it as a fertilizer. Some years since we threw three or four tons of

marl on a large stump heap which we then burned. After the burning we gathered up the ashes and the marl and applied them to young growing corn. It appeared to have a good effect, as we had a splendid crop. As we have never made use of it in a crude state we are unable to say what effect it would have. We use a part of the land, lying directly upon the marl bed, as a vegetable garden, mostly for our own use. We have never failed as yet in having good crops of potatoes, cabbage, &c. The marl lays so close to the surface that we frequently turn up some of it on the point of the plowshare. This quickly pulverizes with the mould. In working the ground, or in walking over the same, you will detect a certain portion of marl all through it. I don't know that I could ascribe all to the properties of that ingredient alone, in producing such splendid crops of vegetables, as we have, or can have, irrigation throughout the summer season."

FRANCIS LAYTON, CENTREVILLE, (LAYTON P. O.) SUSSEX COUNTY,

Says of the shell marl: "It seems to do well applied to sod for grass, but I have not tested it sufficiently to express an opinion as to its value. It seems to do well applied to corn."

G. W. DRAKE, OF NEWTON,

Communicated the following statements in regard to his mode of applying the shell marl and the result therefrom. The marl used was dug on the south side of the (Drake's) pond, one mile south of Newton. He put 57 loads (or tons) on three acres, or very nearly 400 bushels to the acre, which was sowed with wheat in the fall of 1876. This piece of grain was considered the finest in the neighborhood and the crop was large. Last fall the same ground was top-dressed with barn-yard manure and again put in wheat. The *top* was remarkably heavy and green all the fall and it promised another large yield.

Mr. Drake has hauled a little marl in his barn-yard to compost with the yard manure. He mixes it with his hen manure, also finds it useful for fowls to scratch in and so get the lime they may need.

HON. JOHN F. WINSLOW, OF POUGHKEEPSIE, NEW YORK.

“Yours of the 5th came in due course, but not until now have I been able (for many reasons) to find time to reply to your inquiries as to my use of “shell marl” upon my farm. The deposit is upon my farm here (Wood Cliff, two miles north of Poughkeepsie) in a basin, or rather saucer-shaped depression, the area of which is about 400 feet by 80. In excavating it there was first found some two feet of black, decomposed vegetable earth, underlying this was 6 to 15 feet of a shell marl, of a buff color when first dug, but turning white when exposed to the air to dry, and decomposing like slaked lime and quite as fine; in digging, it cuts under the shovel, much like the blue clay in the hills about Albany; this depression is surrounded on all sides by high banks, leaving no outlet for the water flowing into it (mainly from the surface), until it reaches a height equal to the top of the black earth. I commenced digging the marl in 1872 by first taking off the black earth, and as dug hauled it to pasture and meadow land, where it was used for top dressing, and with marked benefit. I then dug some 7 or 800 two-horse wagon loads of the marl, hauling it directly from the pit to an old and sadly run down pasture lot of about nine acres, and the following spring plowed it under, then sowed oats and harvested a crop of 300 bushels, after which another dose of 350 to 400 loads of black earth and marl, plowing them under, sowed rye with timothy and very little clover; the rye yielded a fine crop, while the first cutting of grass gave two tons per acre, the next season two and a half tons, with a moderate top dressing of stable manure in the poorest places. Had not the season been a very dry one (the first of three consecutive ones), the yield would doubtless have been better; but considering this, and the exhausted condition of the soil when I took the field in hand, I consider two and a half tons of good hay per acre quite a satisfactory crop. During the past autumn and present winter I have top dressed this field with black earth and animal manure (one of the latter to four or five of the former), and should the season of 1878 prove favorable, I shall be disappointed if I do not get three tons, *or more*, per acre from it. Upon two other fields of about eight and a half acres each, used alternately since 1872 for corn and oats, I have for three consecutive seasons used the

marl very largely, the natural soil being gravelly and more or less stony. I found them completely run "down and out," and since I owned them have spread them with over 5,000 loads (two-horse) of black earth and marl, chiefly the latter. The corn crops have been much beyond those from adjoining lands of precisely the same natural soil; indeed, I think I may say they have been, with the exception of the first crop, very large ones, while the oats have invariably been heavy, so much so as to "lodge," more or less. Upon what I call the cottage lot, of six and a half measured acres, I used the black earth marl mixed with what stable manure I could get, estimated at one-sixth to one-eighth of the whole, and aggregating 1,000 loads during three seasons, *plowing* all under. The first crop of corn was a good but not a large one, the second was simply prodigious, and judging from the dimensions of my corn crib, was fully 100 bushels of ears to the acre; these were followed by a sowing of timothy ALONE, the first cutting of which was good, but not equal to what I expected. I then top dressed with black earth and stable manure, about half and half, and 200 loads in all, and in 1876 I took from these six and a half acres 40 loads of excellent timothy hay, of 1,810 pounds each. In 1877 I omitted the top dressing and got but four tons per acre, but the season was against a full yield, being quite dry; this autumn and winter I am giving the field a cover of 150 loads of well rotted manure, and look for a good return next harvest. I shall plow this field after next harvest, but before that intend giving it some 300 loads of marl, and then after two or more plowings for grain crops, expect to make these six and a half acres the "champion" grass field of this region.

"Another field of 2.9 measured acres was treated very like the cottage lot, with two additional plowings however. From it I have taken a crop of sowed or fodder corn, that was the wonder of all who saw it. Last season I took 43 measured, or weighed rather, bushels of rye. It is now in timothy grass, and should the skies of '78 be propitious, I look for a cutting of grass equal to that of '76 from the cottage lot. When I bought the farm it was completely worn out, its yield of grass, grain and pasturage being as poor as it could well be; but now I do not regard it as boastful to say that it takes the lead of any lands in the neighborhood of essentially the same soil and surface, and I think I am

correct in attributing this transformation largely, if not wholly, to a lavish use of the marl and black earth with animal manure in moderate proportion upon grass and pasture fields.

“I have also used the two earths for root crops, composting them with stable manure, and here the effect has been as marked as elsewhere. I likewise used both upon potato ground for three years since their discovery, but cannot say very much of my success in that direction, for between a succession of dry seasons and the “bug,” this crop has been almost an entire failure hereabouts. I am not a trained farmer, as you know, but on discovering the marl upon my farm, I perceived it to be largely composed of shells, and knowing them to contain much carbonate of lime, I could not but conclude that it was valuable as a fertilizer in admixture with sandy and gravelly soils, and from which lime was wholly absent. And I think my experience with it confirms this opinion. I am sorry to add that I have nearly exhausted the deposit, but when it is gone, I shall “prospect” for it in other neighborhood localities, and have very little doubt about finding it, believing as I do, that its existence does not depend upon any particular constitution of the surrounding soil or rocks, but may be found, if intelligently sought for, within every few square miles the country over, wherever the physical conditions of the surface are favorable for its formation or accumulation perhaps.

“Whether its use upon clay, loamy or limestone soils would be as positively beneficial as upon sandy, gravelly or stony soils, I cannot say. Perhaps not equal in degree, yet that it would pay generously upon such lands, I cannot but believe.”

An analysis of a sample of Mr. Winslow's marl showed 77.26 per cent. of carbonate of lime, 10.80 per cent. of sand and clay and 12.00 per cent. of organic matter.

These letters on the use of shell marls give the observations of farmers and the results of experiments made by them. Their testimony is not altogether favorable to them. The majority express a general belief in their value, as improving the soil, but several of them do not appear to rest their conclusions upon any definite or carefully made experiments. A few letters are decided in the statement of repeated trials and the benefits derived therefrom. Others are indifferent, regarding them as inert, or inactive, and therefore worthless, as fertilizers. Two or three refer to experiments where their application was injurious to the soil.

These were said to be *overdoses* of the marls. It is difficult to explain these varying results, or to arrive at any general conclusions. The different results may be owing to differences in the marls themselves, or to differences in the soil upon which they have been applied, or to differences in mode of application and the nature of the crops grown. The results of chemical analyses given in the preceding pages show that the marls vary greatly in composition. The essential and characteristic constituent is carbonate of lime. But there is mixed with it in all of these marls more or less sand and clay and rock fragments, which have come from the wash of the surrounding slopes. In the marls which were analyzed, the aggregate of these foreign matters ranged from 0.55 to 23.99 per cent. In all of the surface marls there is some vegetable matter in the form of rootlets, roots and buried twigs, leaves, &c., or as a fine black muck. In some of them there was as much as 7 per cent. of such vegetable or plant remains. Some of the surface marls which have not been examined contain more of these foreign matters than these percentages indicate, and correspondingly less carbonate of lime; and this last named constituent may be said to vary from one-half or 50 per cent. to 99 per cent. in some of the most pure specimens. The most successful and satisfactory experiments have been made with the marls which contain vegetable matter or muck, and, in some cases, more sand and clay—that is, the less calcareous have been preferred to the more pure grades. This is notably the case in Mr. Winslow's use of marl. And this experience indicates the best method of using it is composted with muck, or other vegetable matter. In this way it does not appear to be injurious, even when applied in large quantities. And this agrees with the theory and practice in using lime.

It is well known that liming heavily and frequently exhausts the soil, unless the latter contains sufficient organic matter, or is kept well supplied with it, in the shape of barn-yard manures, clover, or muck. With these the lime helps. In this place it may be well to state that neither lime nor any other mineral manure is sufficient unaccompanied by some nitrogenous material or organic matter for plant nourishment, as the crop cannot thrive on it alone. And here seems to be the reason for some failures with these marls. Too much has been expected of them,

Composted with muck, or barn-yard manure, or used upon grass so as to promote its growth, they must always do good.

Differences in the soil also explains in part the varying results obtained from their use. Some have applied them on slate soils, others on limestone and others still on the drift soils covering these rocks. And we cannot expect like results upon soils so unlike in their origin and nature. There are soils in which there is already enough lime for the nourishment of heavy crops upon these there may be no need of supplying more in the shape of marls.

On some of the light, thin soils of the drift, or on the gneiss rock and also on the slate soils there is generally an insufficient amount of lime for heavy cropping. To such these calcareous marls may be advantageously given. One instance is known where marl was applied on a soil largely made up of this marl. Of course no good was seen. These differences in soils as regards the lime in them show the importance of taking into account all the conditions of the trial before coming to a general conclusion. From the result upon a rich, limestone soil it does not follow that the same will be the case on a drift, or on a slate soil, or *vice versa*.

The mode of application and the crop to be grown are important considerations. The trials in some cases appear to show that these marls used alone and in large doses may do injury to the soil and crop. With muck or when they are mixed with sand and clay, they seem to be altogether beneficial, even when applied in large amounts. Certain crops are well known to like calcareous soils and to thrive with calcareous manures.

The clovers and other leguminous plants, as the pea, bean and others, are fond of such soils and manures. The experience with the more calcareous of the marls which are used in the southern part of the State, points to clover as the crop most promoted by marling; and in this way the soil is indirectly fertilized by making more barn-yard manure or by green manuring. This practice of the farmers of South Jersey may be adopted with profit by those of Sussex and Warren counties who are near enough to these shell marl deposits to use them.

Calcareous marls not only furnish lime for the many compounds of lime which enter into the plant structure and composition, but also improve the texture of the soil. They are *amend-*

ments to it. These marls are all exceedingly fine—much finer than the finest loam or clays; and this makes them fit for loose, open soils, making them more compact and close and a better stratum or bed for the plant roots, holding the moisture better and in every way aiding the rootlets to perform their functions so vital to the plant development. Again, carbonate of lime differs from clays—which may be nearly as fine and which may make a soil compact—in its lack of plasticity. Clays when wet are tough and plastic. On drying, they shrink and crack. Marls, consisting of this fine carbonate of lime, counteract these tendencies of the clays, making the clayey soil more pliable, or more easily worked; and soils thus corrected do not *bake* so hard or crack open as stiff clay land. For these uses such marls are valuable; and in many cases there is a greater need of such amendment to the soil than of fertilizers, which may simply furnish plant food, or material for the crop. It is well known that liming helps a tight soil, and also tightens one which is too loose. These marls act in the same way, but not so energetically as the caustic lime; and their use in supplying lime, as one of the plant constituents and in improving the texture of soils so that they are at all times easily worked, is here suggested in place of the lime, as cheaper, milder, more enduring and equally as efficient; and where used there is no need of the lime. But the organic matter and nitrogenous fertilizers, whether in the form of barn-yard manure, muck, or clover as a green manure, must not be neglected. These must supplement the marls. Together they suffice for nearly all soils and crops, and the farmers who have a stock of them at home have the material to make their lands permanently fertile and highly productive.

We would urge farmers who have, or who can get, this marl, to give it a careful trial, composting it with muck, sods, or weeds and rubbish, and applying it at the rate of 10 or 15 loads per acre, and then noticing its effect through the entire rotation of four, five, or six years. Its benefits will be seen on some of the crops.

GREENSAND MARLS, FROM THE LOWER MARL BED.

The Freehold and Keyport R. R. has opened to the general market the marl from the Lower Marl Bed, by passing directly

across it at Marlboro, Monmouth county. The marl from this Bed is characterized by its containing, besides the phosphoric acid and potash, a considerable percentage of the carbonate of lime in fine powder. It has always been used with good results, and can be safely recommended to those who wish to buy marl for a fertilizer; and its opening to the general market is a public benefit. The composition of the marls is well shown in the analyses following:

MARLS FROM THE PITS OF OBADIAH C. HERBERT, MARLBOROUGH,
MONMOUTH COUNTY.

1. Top marl from above shell layer:

Phosphate of lime.....	3.49
Carbonate of lime.....	20.72

This marl represents a section three feet immediately over the shell layer.

2. Marl of the shell layer:

Phosphate of lime.....	3.34
Carbonate of lime.....	27.88

This layer is two feet thick; it contains many large shells.

3. Marl just under the shell layer:

Phosphate of lime.....	2.92
Carbonate of lime.....	13.52

This grade represents a thickness of five feet, from the shell layer downward.

4. Blue or black marl, just over the sand marl:

Phosphate of lime.....	2.23
Carbonate of lime.....	6.29

This marl is two to three feet thick.

5. *Sand Marl.*

Phosphate of lime.....	2.79
Carbonate of lime	1.86

The sand marl is sometimes used on heavy land, but it is not sold.

6. "*Gunpowder, or Poison Marl,*" from upper pits. And this lies above Nos. 2, 3, &c.

Phosphate of lime.....	1.11
Carbonate of lime.....	0.00

This marl is sour, i. e. has a strong acid reaction. And it contains some sulphate of iron. The total percentage of lime is 1.64. It contains the usual percentage of potash. It needs to be used composted with lime, or alone, with care, on account of its acid properties. All of these marls contain potash from four to six per cent.—combined in the greensand with other bases as a compound silicate.

MARLS FROM URIAH SMOCK’S MARL PITS, MARLBOROUGH, MONMOUTH COUNTY.

1. *Average of nine feet from surface to bottom of shell layer.*

Phosphate of lime.....	2.38
Carbonate of lime.....	8.02

2. *An average of eight feet from bottom of the shell layer to the sand marl.*

Phosphate of lime.....	3.21
Carbonate of lime.....	3.14

The potash was not determined. It amounts to about 5 per cent. Taking the average of the 17 feet the phosphate of lime amounted to 2.8 per cent. and the carbonate of lime to 5.6 per cent. of the whole. Such averages give a better and fairer exhibition of the value of a marl than analyses of specimens selected from different levels. To put it in another shape 100 tons, or loads,

from a pit of this depth (17 feet) would contain nearly three tons of phosphate of lime, or bone dust, and between five and six loads of the finest *chalk marl*, or carbonate of lime, besides the potash and other constituents, all of which assist in the nourishment of the plant.

The following analysis of the green marl of the *Fostertown and South Branch Marl Company, at Medford, Burlington county*, was not completed in time for insertion in the report of last year. It represents the average green marl of the middle bed as that bed is opened and worked there.

Phosphoric acid.....	1.02
Silicic acid and sand.....	50.70
Potash	7.37
Lime	1.32
Magnesia	3.74
Alumina and Oxide of iron.....	28.52
Water.....	7.70
	<hr/>
	100.37

The following letter of Dr. Theodore T. Price, of Tuckerton, Burlington county, on the use of marl in his neighborhood, came too late for last year's report. It is printed here as being of interest and suggestive. The Squankum marl referred to as being more beneficial than the green marl of Burlington county on light soils, comes from the Squankum Marl Company; and this marl is finer-grained, and contains a little greenish-white clay. The Pemberton and Fostertown marls are coarser-grained, and they are made up very largely of green sand without any admixture of clay. Variation in physical constitution or texture and chemical differences, as well as differences in soils themselves, render it very difficult to generalize in regard to the value of any given marls, and experiments cannot be regarded as decisive which do not take into account these points.

“ I forward, tho' late, such information as I have been able to gather concerning the use of marl in this neighborhood.

“ It has not been used very generally, the price per ton, at which it is delivered at our R. R. stations, being from \$1.75 to \$2, is too high to induce our farmers to purchase it to any great

extent. The average cost delivered on the farms, is about \$2.50 per ton.

“A gentleman residing in New York, owning two farms in this vicinity, has used it heavily for four or five years past, and with excellent effect in increasing the crops of grain and grass on them.

“Besides this case, others have used it only sparingly; a few hundred tons would cover the whole shipment outside the case above mentioned. I have used on my lands about one hundred tons altogether, and believe it to be valuable as a permanent fertilizer of the soil. It also increases the productiveness of such crops as grass, potatoes and corn, when applied directly to them, but my experience with it is too limited to speak confidently of its comparative value with barn yard manure.

“I am of the opinion, however, that we cannot afford to use it at a higher price than \$1.50 per ton at R. R. station, and have doubts of its profit at that price while we have fertilizers of much more stimulating properties near at hand.

“The few who have used marl in this vicinity give differing testimonies of its action.

“Jonathan Cox and Sons, of West Creek, tried a train load of Fostertown marl, and say it did well on heavy land, but was almost valueless on lighter soil.

“Jos. B. Sapp and J. Ireland have used Pemberton marl, and speak highly of it, on all crops and all soils.

“A. R. Pharo thinks marl makes its mark on lighter soils, even more clearly than on heavier lands.

“It is generally believed here that Squankum marl is best for light lands, and Pemberton marl for heavier soils.

“For improving grass and grain, broadcast spreading in fall and winter is thought to be best; for corn and vegetables, composting with other manures is believed to be preferable.”

ON THE PRODUCTS OF GENERAL FARMING, SWEET POTATO GROWING, DAIRYING, AND THE CULTIVATION OF PEACHES AND APPLES.

The following statements were made by farmers in various parts of the State, and are intended to show some of the results of good farming, as it is carried on at the present time. They will be found interesting, in that they bring together the methods pursued in different parts of the State, and instruction may be drawn from the comparison.

It is but just to those who have furnished statements, to say that they have all been furnished at short notice, and no preparation had been made for it by records, measurements and weights, set down through the year. The very low prices of farm produce during the past year has made the statements less promising than they would be in more prosperous times.

It is creditable to New Jersey farming that such good statements of its condition can be made. And the writers are entitled to the thanks of all our farmers for their instructive and plain statements. The thanks of the Board of Agriculture are hereby tendered to these public spirited contributors.

It is hoped that these will incite many others to keep a careful record of their farm management and its returns, and that should another occasion offer for collecting statements of the results of good farming, many more full and profitable ones will be obtained.

THE FARM OF THE STATE AGRICULTURAL COLLEGE, NEW
BRUNSWICK,

Contains nearly 100 acres, all of which is tillable land. The soil is mostly a clay loam underlaid by a tenacious clayey subsoil. A part of the farm has some gravel in the soil and subsoil which is not so close and tight bottom as the rest. In consequence of the flat surface in some portions and the close subsoil very much

underdraining has been necessary to make the surface workable and to put it in proper condition for growing crops. It is used for general farming, producing the staple crops, and experiments with fertilizers are carried forward; and a large dairy is kept for the production of milk which is sold in the city of New Brunswick.

The crops of 1877 consisted of wheat, rye, oats, corn, Irish potatoes, carrots, mangold wurzels, turnips, cabbage, hay and fodder corn.

Wheat.—There were 13 acres, in one field, devoted to this grain. The preceding crops were oats on 10 or 11 acres and potatoes on the rest of the piece. All of the ground was in good condition. Four acres, the best of the field, were sowed with Clawson, and yielded 94 bushels—at the rate of $23\frac{1}{2}$ bushels to the acre. Nine acres, of the Fultz variety, produced 234 bushels—or at the rate of 26 bushels per acre. This variety has done better than any other. And on some experiment plots in previous years the yield has been as high as 48 bushels to the acre.

Rye.—Of this grain we raised 1.6 acres. It was on the best ground; three bushels of seed per acre. It grew well and was so tall and heavy that much of it was lodged. The straw and grain as taken from the field, weighed $6\frac{1}{2}$ tons, and the grain amounted to 80 bushels, or 50 bushels to the acre. The ground had been heavily dressed with barn-yard manure in the spring previous for fodder corn, and when the rye was sowed it was dressed with *lute*, a gas-house refuse material, consisting of clay and lime.

Oats.—Eleven acres were in oats—the corn ground of last year. The crop was not threshed at the time of writing. A variety sent from the Department of Agriculture was decidedly earlier and better than the common kind.

Corn.—Thirteen acres of sod ground were put in corn. The fertilizer used on it was a handful of compost of coal ashes and hen manure in each hill. The whole crop was 800 bushels of ears. A part of the corn ground was not underdrained and the crop on this was not equal to that on the flat and drained portion.

Potatoes.—This crop was grown in three plots. One of $1\frac{3}{4}$ acres, which was in carrots last year and well manured, yielded at the rate of 137 bushels to the acre. A second plot, of $\frac{1}{4}$ acre, of our best corn ground of last year, and manured with Forrester's

potato fertilizer, produced 40 bushels—at the rate of 160 bushels to the acre.

Carrots.—Two acres were in carrots. This ground was manured with 15 loads per acre, from the barn-yard, and 500 pounds of Lister's superphosphate was used on one acre, and 500 pounds of the U. S. Fertilizing Co.'s phosphate on the other. The carrots were planted in rows 30 inches apart. The total crop was 810 bushels, besides 100 bushels of yellow globe turnips grown in the blanks of the carrot rows. The cost of the crop, per acre, was \$66.25; the sales amounted to \$151.75, leaving \$85.50 to pay for interest on land and cost of marketing.

Mangold Wurzels.—This crop was grown on one and three-fifths acres. The ground was very good, and had received twelve loads of barn yard manure and 600 pounds of superphosphate to the acre. The yield was 750 bushels of mangolds and 104 bushels of yellow globe turnips. The crop is fed to the farm stock. The whole expense of raising was \$70.75.

Turnips.—Two acres were in ruta bagas. The dry weather hurt them, and the yield was at the rate of 162 bushels per acre.

Cabbage.—Two and one-fifth acres were planted with cabbage. The plants headed well. The low prices did not make the crop remunerative.

Hay.—The crop was very short, the roots being hurt by the dry weather of last year. From 27 or 28 acres only 35 tons were obtained.

Fodder Corn.—Two and a third acres were sowed with corn. It was of extraordinary growth, and estimated at about ten tons of dry fodder per acre.

Pasture.—Five acres of ground are devoted to pasture.

The stock on the farm consists of 13 cows. Of these 6 are Ayrshires and the others native stock. They gave, during the past twelve months, nearly 34,000 quarts of milk, and 32,803 quarts were sold in New Brunswick. This gives an average of 2,660 quarts per cow, or a little over 7 quarts a day from each cow.

A small stock of Jersey Red swine is kept.

For the farm work four horses and two mules are kept.

MARTIN J. RYERSON, OF BLOOMINGDALE, PASSAIC COUNTY,

writes: "In reply to your favor of the 15th, I hardly know where to commence, for to go into details of my farming would be quite too lengthy. When I was engaged in iron manufacture, &c., my plan was to put as little work on the preparation of the land for crops as I thought would answer to ensure fair returns, but the last ten years I find it pays better to put the land in the best condition for crops. For corn, I plough old grass fields from seven to eight inches deep in the spring; when ploughed in the fall, nine inches if the soil will allow; prefer ploughing old meadows in the fall. I manure all in the hill with half a shovel of compost, and frequently cover the ground with coarse stable manure before ploughing in the spring. I raise from 100 to 110 bushels of ears per acre, and plant about 40 acres per year. The expense of cultivation is about one-half the price of the crop, but do not charge the manure, or lime when used, for the succeeding crops are also benefited. I would mention that my land was worn out when I began farming, and it has all been limed. I follow corn with oats. Last year I had a very large crop, 96 loads yielding 40 bushels to the load, and the yield was at the rate of 75 bushels to the acre. I follow oats with wheat or rye; plough as soon as the oats are gathered; cover the ground for wheat with manure, and plough about four inches deep, or use a cultivator; sow from the 15th to the 20th of September. Wheat last year only 15 bushels per acre, of white Mediterranean, and rye 10 bushels; both injured by dry weather early in the season. I sow timothy and clover on wheat and rye, but for several years the seed has not taken in consequence of dry weather, and I think the roots of old hay fields are affected by the same cause, and they produce only half crops, except on moist lots, which yield two tons of hay per acre, and, in good seasons, three tons. This is on land which produced a half a ton only when I commenced its cultivation. Last spring I conveyed water through a six-inch pipe on a lot of $13\frac{1}{2}$ acres, and partially irrigated with gratifying results, yielding two tons of hay to the acre. I would recommend irrigation when it can be used, especially for grass.

"I do not use any manures except stable and yard compost with

charcoal dirt. Make a pile about four feet deep, and cut up with a long hand hoe when I wish to use it.

"These remarks apply to my farm at this place where the land is a nice loam with yellow clay bottom.

"The soil on my Pompton Plains farm is a gravelly loam with gravel bottom, and produces about three-quarters as much as this farm, and requires more manure with same cost of tillage, producing all the above crops. I have used several hundred loads of muck composted with slaked lime as a top dressing for corn and wheat, and with good effect, but not equal to manure—about ten per cent. difference.

"The mountain lots we plow occasionally for buckwheat and get about 25 bushels per acre. Some fallow the following year and sow to rye; get from 15 to 20 bushels per acre; and seed down for pasture; not using any manure.

"The apple crop does not amount to much in this township. The farmers raise their own supply. I think that the hilly lands could be made to pay for apples, if properly attended to."

ANTHONY L. DAY, STOCKHOLM, PASSAIC COUNTY,

Writes, "In answering your letter asking about farming bog lands, I will give you a little of my personal experience, that you may understand some of the difficulties and discouragements I have had in reclaiming that sort of land.

"In 1843, owning, with my brother, a farm on which there was about 100 acres of bog meadow and swamp, at the head of Dunker pond, we resolved to improve it. The outlet of the pond was a deep and narrow, rocky gorge. Our first business was to deepen and widen this outlet. It was a difficult and expensive job. We succeeded in getting a channel two feet deeper and about four feet wide. We then commenced ditching the black ground, cutting about sixty rods of main ditch, eight feet wide and two and a half feet deep. Five cross ditches were three feet wide and two feet deep. One or two shore ditches were dug. Then, with much difficulty, on account of the softness of the ground and unsuitableness of our plow, we succeeded in plowing two fields of about two and a half acres each. On one we sowed buckwheat; it grew very fast and rank until it came into bloom, being about four feet high, when it went down flat, and was an

entire failure. The other field we sowed with rye, which did a little better, the crop about paying for the seed. We abandoned the rye field, as it was softer and more difficult to plow than the other. The next season we planted corn on the first field, and experimented a little with onions, beets, parsnips, peas and other garden vegetables. The onions and other roots succeeded pretty well. The corn made good stalks, but the grain was shrunken, soft, and of little value. Then we decided to try potatoes, and planted about one and a half acres of the driest and most easily cultivated portion of the first field with potatoes and had a good crop. For two or three years after that the potatoes grew well, and that without any fertilizers of any kind. For several years the little patch of bog ground was kept for potatoes, and whenever we had a dry season and used a little ashes we would get a good crop. Then I began the work of widening and deepening the ditches and the outlet, and bought better plows and other tools. I bought all the wood ashes that I could find, and this was the only fertilizer used for a long time. I have never used any barn yard manure because I needed it all on the upland, but I have hauled hundreds of loads of muck from the ditch banks on the upland, and to good advantage. This little patch of bog ground, where our first experiment was made, has been cropped every year for at least thirty-two years, often without any manure, and never with more than a little ashes, lime or plaster in the hill, and two dressings of salt of about two bushels to the acre. It has steadily improved in fertility and value, which is, I believe, more than any other kind of soil in the State would have done under like treatment. And I have made it pay, besides the increase in the value of the land, to the extent of 500 per cent. I have now twenty acres improved, and I am preparing more.

“This bog land, lying in the valley at the head of Dunker pond, varies from 20 to 80 rods in width. The stream originally flowed in a zigzag course through its whole length. And it was so soft that the bog hay had to be carried out on poles. I drained it by cutting a central ditch eight feet wide and two and a half feet deep, lengthwise the tract. This has cut out to a depth of three and a half feet through most of its length. I then cut cross ditches six feet wide and two and a half to three feet deep, making the fields about fifteen rods wide, and varying in length

according to the width of the valley, with shore ditches where necessary six feet wide. The ditch bank has been scraped back towards the centre of the fields, using for this work, a road scraper. This will, I think, greatly aid the drainage. And I think, it is very important to have all ditches three to three and a half feet deep. I clean out old ditches every two or three years, as water is the great obstacle in the way of reclaiming these lands. The crops raised have been potatoes, corn, corn fodder, oats and grass, and I have experimented a little with broom corn, onions, turnips, and oats for fodder.

“In cultivating, I cut the bogs and burn them on the ground; then with a steel plow, the share and coulter being as sharp as they can be made, I turn the sod as evenly as possible, taking a dry time for it; then leave it to the action of rain and frost until the next spring; then harrow well; then plant corn in drills for fodder, planting about the middle of June; plow the corn once, fodder what I need through the drought of summer; then cure the rest for winter fodder, getting more fodder to the acre than from anything else I have tried. For potatoes I plow and harrow as for other crops; furrow the ground both ways; plant in hills, two and a half feet apart; plant from the first to the middle of June; immediately after planting, I put on wood ashes, using a little shovel about the size of a man’s hand, and putting a shovel full on each hill. I commence plowing as soon as the tops peep through, putting one furrow in a row both ways, with a small double mould board plow. I plow about three times in a season; hoe but little. By planting late, I am not troubled with the first crop of potato bugs. My potatoes get from eight to ten inches high before the bugs make their appearance. As soon as the young begin to hatch out, I knock them off and scald them, going over the field from four to six times in a season. I prefer this method to that of using Paris green. The crop is gathered about the first of October. I haul them into the cellar as fast as they are dug. They never rot. I think they rot less than potatoes grown on other soils.

“For corn the ground is prepared as for other crops, and furrowed about three feet both ways. I plant from the middle of May to the first of June, a small growing, early ripening variety. I cultivate as for potatoes. Plaster, lime, or ashes are used as

fertilizers—put on the hill after the corn is about six inches high.

“For oats, I sow about two bushels of salt to the acre, after harrowing in the seed. This, I think, strengthens the straw, which grows very tall on this soil.

“I have tried timothy, but never had much success with it, as it grows well but runs out soon.

“*Fertilizers.*—Plaster, lime, hen manure and salt; have experimented with German potash salts, but do not think them worth their cost.

“*Yield per acre.*—Potatoes, 200 to 250 bushels; corn, 75 to 125 bushels of ears. We have not measured the oats or the corn-fodder, but I believe these yield very much better than the average of my upland.

“*Returns and Profits.*—I will answer these questions by giving as nearly as possible the cost of raising one field of potatoes and one of corn this last season, and the values of the crops :

Potato field, 2¼ Acres, 30 Years under Cultivation.

Plowing and harrowing 1½ day, team \$2.50.....	\$3 75
Furrowing, 1 day, 1 horse, \$2.00.....	2 00
Planting, 1 day, 3 men, \$1.00.....	3 00
Seed, 25 bushels, \$1.00.....	25 00
Ashes, 70 bushels, 20c.....	14 00
Putting on ashes, 1 day, team and 2 men.....	3 50
Ploughing, 3 times, 2½ days, 1 horse.....	5 00
Hoeing, 5 days, \$1.00.....	5 00
Picking off bugs, 6 days, \$1.00.....	6 00
Digging potatoes, 15 days, \$1.00.....	15 00
	<hr/>
	\$82 25
	<hr/>
Crop of 485 bushels marketable potatoes @40c.....	\$194 00
Crop of 40 bushels small potatoes @20c.....	8 00
	<hr/>
	\$202 00

Corn field (not measured, about same size), 5 Years in Cultivation.

Ploughing and harrowing, 1½ days.....	\$3 25
Furrowing, 1 day.....	2 00
Planting, 3 days.....	3 00
Seed, ½ bush.....	50

Ashes and hen manure, 60 bush.@20c.....	\$12 00
Putting on manure.....	3 50
Ploughing corn, 4 times, 3 days.....	6 00
Hoeing, 2 days.....	2 00
Cutting and shocking, 4 days.....	4 00
Husking, 8 days.....	8 00
	<hr/>
	\$44 25
	<hr/>
Crop of 250 bush. ears@60c.....	\$75 00
Stalks	15 00
Five loads of pumpkins@75c.....	3 75
	<hr/>
	\$93 75

SILAS CUMMINS, DANVILLE, WARREN COUNTY,

Writes, "You ask about my plan of growing onions. There is no trick about it, if you have the right kind of ground. The muck is from two to four feet deep and drained by small ditches and then cultivated for a year or two, so as to get it thoroughly subdued. In the fall draw manure at the rate of 50 loads to the acre; in the spring plow it under, or give it a good harrowing to loosen the surface, raking off all the lumps and sticks that are in the way. I plant from the first to the last of April, or as soon as the ground is dry, in rows about fourteen inches apart. I roll the ground with a hand roller, so as to make the seed come up sooner and better. I have raised at the rate of 600 bushels per acre.

"In regard to the soil, it is not strong; more like a light, sandy soil. It won't pay to farm it without feeding it pretty strong. The first two or three crops will exhaust it and it will be good for nothing unless manured again."

JACOB H. CRAMER, CHESTER, MORRIS COUNTY,

Writes, "Yours of the 21st received, and in the language of Mr. Greeley, will tell 'What I know about farming.'

"In the year 1837 I purchased a small farm in the northerly part of Chester township, containing about 100 acres of land. One-half of it was tillable land the other part woodland and bog meadow, or muck land. It was located on the south side of Flanders mountain. The north line was on the top of said

mountain and extended nearly a mile south to the Black river. About 10 acres on the north was a coarse, gravelly, dark colored earth; the next section was a loose clay and sandy loam; at the foot of the hill almost pure sand; and the meadows, as before stated, of black muck. The farm, as a whole, was as completely worn out as could possibly be, as I experienced the first season. On one lot of five acres sowed with buckwheat, the yield was not over six bushels on the whole lot. The balance of the plow land was equally poor. And now commenced my experiment in renovating my land. The first experiment was on the five acre lot above mentioned. It was thus: I bought and spread 150 bushels of unslaked lime, costing at that time 8 cents per bushel at the kilns, then sowed with oats and clover seed, (6 quarts to the acre) which cost me at that time, \$14 per bushel. There being no vegetable matter in the soil the oats was very poor. But the clover seed took well and made a good start; in the spring following, plastered on the five acres at the rate of two tons per acre. The lime and plaster was very congenial to the growth of the clover and in June I had something to be proud of. The first week in July I turned it all under and in September, when crossed, the clover presented a heavy coat of manure, sowed it with rye and harvested 1,200 sheaves, yielding in the aggregate 72 bushels of good, merchantable rye. This is a fair sample of the management of the other tillable land, so that in two year's time there was not an acre, excepting the sand soil near the meadow, but would yield a good average crop of wheat. On one lot of three acres I measured 140 bushels of corn, after the same management as aforesaid.

"After experimenting with wheat, the most profitable practice was found to be to plow the oat stubble as soon as the crop was gathered; put on all the barnyard manure, or after breaking the stubble, cross and sow about the last week in September. This mode did better than putting the manure on corn ground. Corn on a good clover sod, on land managed as above, will no doubt grow well.

"Allow me to mention my success with a small piece of buckwheat, on the gravelly hill-side, on three acres of which, I sowed three-quarter bushel of seed (one peck to the acre). The land was in tolerably good condition. After sowing, about two tons of bog ashes were spread over it, with good effects. The straw

when ripe, stood about five feet high, having branched out when about a foot high, from six to ten branches. One stalk I measured was six feet three-quarter inch high, and one and three-quarter inches in circumference. The yield was sixty-seven bushels from the lot (all of which record I now have before me).

"From my experience, in order to enrich land with profit, a coat of lime—say thirty-five bushels to the acre—once in three years, with land kept well seeded to clover, will prove the surest and least expensive way. I have tried the various artificial fertilizers, but never to my mind, realized any profit, in comparison to the cost. Put lime on the ground in the fall, or early winter, at the rate of forty bushels to the acre, once in three years, and invariably on clover sod, to this add about ten wagon loads of coarse barnyard manure in the spring; turn all under; a good crop of corn is ensured.

"My principal crops were corn, wheat, oats and occasionally a small piece of buckwheat and potatoes. These were the crops which paid best.

"As to our mode of cultivation, those were primitive times. Mowing machines and horse rakes were unknown, except the old dray rake; threshing machines were not in use. Stock raising was out of the question, except the cows for the family supply of milk, from which, with one acre of potatoes, one ton of pork was produced. This was the annual calculation.

"I sold that farm in 1859, for \$4,250, and purchased one in the valley of Chester; but I have had it worked by a tenant, and, of course, have not much to say with regard to his farming. In 1873, on account of minerals, this was sold for \$30,000, and I have retired from the arena of the farm."

JACOB FLOMERFELT, PEAPACK, MORRIS COUNTY,

Furnishes the following farm statements: "The average size of our farms is about 140 acres. For our synopsis we will take one of about 100 acres, of which 84 acres is under cultivation, the rest timber land, etc. Our farms are usually divided into seven fields, and according to our system there are of—

"*Corn*, two fields, or 24 acres; average yield of shelled corn 35 bushels; highest, 60 bushels.

" *Wheat*, one field, or 12 acres; average 16 bushels; best 45 bushels per acre.

" *Oats*, two fields; average yield 25 bushels; best 40 bushels to the acre.

" *Hay*, one field, 12 acres, one season only.

" *Pasture*, one field, 12 acres, one season only.

" One field of oats is followed invariably by wheat; the other is seeded (with the oats) for grass. Corn follows the grass. Occasionally an acre or two of rye, or buckwheat are raised. Barley is not grown. Potatoes are raised for home supply only.

" *Stock* consists of four horses, six cows, five hogs, fifteen sheep and eighty fowls.

" *Fruit*—Peaches on high ground with good market will net \$100 per acre when the orchard is in its prime. After two crops the fruit deteriorates and the trees die. Apples grow well and more interest is manifested for choice fruits and less for poor stuff from which whiskey is made.

" *Barneyard manure* is our fortune, but large quantities of lime are used with good results, about 500 bushels on above sized farm and costing eleven cents per bushel. One farmer in Peapack Valley has applied 22,000 bushels in twenty-two years and with good results.

" *Labor*—One man at \$150 a year and board, and occasionally a day hand, at one dollar a day, excepting in harvest, etc., one and a half to two dollars a day.

" *Results*. On a farm of this size, if the owner is a good manager and works himself, making his fence and ordinary repairs and practices *economy* in all his affairs, he can net, as prices are now, about \$425. Peaches are not included in this account.

" Farms are worth, on an average, \$65 per acre.

" Not much grain is fed to stock and but little hay is sold.

" We give the above, believing it to be as accurate as possible without actual measurement of fields and crops."

JOHN T. LEIGH, CLINTON, HUNTERDON COUNTY,

Furnishes the following farm statement: "In reply to yours of the 31st, will give you my own experience in farming. In answer to the questions you ask:

“First—I farm 335 acres, a part of it limestone, the balance river bottom—black loam and a portion red clay soil.

“Second—Principal crops: corn followed by oats, and then wheat, which farming is done only to keep the land sufficiently well in with grass for pasture and hay, that being done to make milk for New York market.

“Third—Barn yard manure and lime are the principal fertilizers employed, although I use some bone and phosphate with good success, drilling in with wheat. Last fall I drilled phosphate with wheat—40 acres—and it is now looking well. I think that there is less trouble with the fly than when I use manure. For corn and grass there is nothing better than barn yard manure, put on in the fall, or better in the winter, and the best results have been when spread in winter, then with a fall of snow to come and cover it for a month or so.

“Fourth—My land is divided into two farms. On one I pay one-third of all the money received for grain raised, or the market value therefor, and one-fifth of all the money received for milk made, my farmer doing all the work at his expense for labor. I furnish all the stock, feed, farming utensils, in fact everything but labor. On the other I give a man \$450 and some privileges for his services. In both cases I furnish a good, comfortable dwelling. I keep on an average about 100 dairy cows and 70 to 75 of them constantly in milk, and average 16 cans of 40 quarts per day, winter and summer. The average price is \$1.50 per can at the railroad depot. All of the grain raised is consumed in feeding cattle and horses, except the wheat, most of which is sold. The production of milk is the leading object, it being more profitable than grain, and also rendering the land more productive by consuming all that is raised. The most economical and profitable course is probably to interest the laborer by paying him a share of all the money received.”

ABRM. T. HUFF, OF NESHANIC, SOMERSET COUNTY.

•

“In compliance with your request through the State Board of Agriculture, for answer to certain questions, I submit the following:

“Size of farm, 200 acres—one-half red-shale, one-quarter sandy

loam, the remaining, low meadow (or first bottom); the latter is kept for pasture. The shale and loam are ploughed and cropped in rotation; grass for hay (clover and timothy) first year, then in succession, corn, oats, wheat, and again grass; this rotation allows one year of sod to three of broken ground. Except for experiment, I use no fertilizers but those made upon the farm, with the addition of stone lime, which is applied once in four years, using about twenty-five bushels to the acre. This amount gives as good results as a greater quantity, being sufficient to neutralize the acidity in the soil and to produce a mechanical effect upon the heavier soils. The crops are not benefited by manufactured phosphates. I have experimented for the last ten years, with different phosphates, using from three hundred to one thousand pounds per acre, drilled with wheat, and have never seen either increased length of straw or yield of grain, and having arrived at the following conclusions, propose to wholly abandon their use:

“First—That any farm pastured too closely, and upon which a small amount of stock is kept for several consecutive winters and fed principally upon cornstalks and straw, the hay and grain being sold from the farm, will proportionately become wanting in phosphates, and then the application of merchantable phosphate (if true to their analysis) will be a source of profit to those applying them;

“Second—That any farm whose tillable land is kept shaded during the hot months of summer by a good growth of grass, so that humus may accumulate, and upon which the coarse fodder, together with a good proportion of the hay and grain grown, is fed to the farm or other stock kept through the winter, for several consecutive winters, will afford all the phosphate that subsequent crops will require, and will continue to increase its supply as long as this course is pursued. My own experiments and what I have observed from the experiments made upon farms near me, lead me to the following conclusions: The basis of good and profitable farming in this country is in proportion to the amount of barn-yard manure that can be made and applied to the soil, together with an intelligent application of lime.

Yield of rotation crops that were grown last year (1877): 40 acres of wheat, 26 bushels average yield per acre. Varieties grown, and yield—Blue stem Mediterranean, 25 bushels per acre;

Seneca, 28 bushels per acre. Three-fifths of the ground was fertilized with barn-yard manure, eight cords per acre; one-fifth with three samples of phosphate, from different manufacturers, 300 pounds per acre, drilled in with the wheat. The remaining one-fifth had no fertilizers of any kind, and the yield of straw and grain was equal to the phosphated plot. It was all limed with 25 bushels of stone lime per acre. That portion fertilized with barn-yard manure gave an increase of 30 per cent. over the other two plots, and a greater per cent. in the fall growth of grain in the stubble.

Oats, 30 acres—average yield in weighed bushels per acre, 40. It is my poorest crop. I always grow it at the expense of the succeeding wheat crop. It usually lodges early in the season, or is injured or destroyed by some climatic influence.

Corn, 40 acres—15 acres fertilized with barn-yard manure, 8 cords per acre, spread upon the soil and plowed under; yield of this plot, 55 bushels per acre. The remaining 25 acres had no fertilizer of any kind—yield 40 bushels per acre. The whole crop was injured by the ravages of the wet worm.

Hay—failure. The continued drought of the previous summer killed all the clover in the stubble, the yield not being more than a half crop.

“There are no leading objects pursued which might be classed as specialties. Dairying is on the increase, especially the sending of milk to New York City. There are no cheese factories, nor co-operative creameries.”

LAWRENCE VANDERVEER, BROOKSIDE, MONTGOMERY TOWNSHIP,
SOMERSET COUNTY,

Writes, “My farm consists of about 160 acres, lying on a tributary of the Millstone river, in the southern part of Montgomery township, Somerset county. Of this about one-third is meadow land, subject to overflows, and which is generally in grass, either for pasturage or mowing; about one-fifth a deep, rich alluvium, or second bottom land, and the remainder ordinary upland in fields. The soil almost entirely red shale, occasionally interspersed with clay. The subsoil is red shale rock, but lying deep, here and there a cropping out at the brow of a hill.

“We grow principally corn, oats, wheat, potatoes and grass,

rotating in the order named. Plow sod for corn ; the next year oats ; plowing the oat stubble for wheat, then cover with barn yard manure, harrowing soon after spreading, and cultivating the ground just before seeding, putting one and a half bushels to an acre. Never use a roller on land for wheat ; think it better to have the surface a little rough. Have tried the different fertilizers, but never to any profit. Barn-yard manure the only fertilizer, excepting lime once in ten years, about twenty-five bushels to an acre. Ashes may also be used with profit. Twenty or twenty-five bushels of wheat per acre we consider a fair yield ; corn and oats about fifty bushels, although seventy-five bushels of corn is not an uncommon yield on the meadows ; hay about two tons on upland and three on low ; average yield of potatoes about 200 bushels per acre ; prefer a clover sod for potatoes which has been mowed once, leaving the second crop on the ground and, in the fall, spreading manure broadcast, about fifteen loads to the acre ; after potatoes, wheat grows finely without any additional manuring. Have on our farm usually about eight horses, including colts ; thirty cattle, and swine enough for home use ; never raise any calves, but buy from droves and select the best for milch cows. Purchase yearling steers and keep them through the winter, principally on corn stalks and straw, and sell them from the grass next season. By this means the purchase money can be doubled with very little cost."

JAMES NEILSON, NEW BRUNSWICK.

"In accordance with your request, I send the following statement of my farming operations for the year ending December 31st, 1877. The farm lies on the southerly side of, and partly within the city limits. For the past twelve or fifteen years, the principal sales have consisted of milk, which is sold at the barn to the dealers. The grass land is intended to be broken up when the crop begins to fail. The soil is a gravelly clay loam, much of it with a close subsoil, and is, of course, a drift over the red shale. About 150 acres are under actual cultivation (including grass land), although by growing fodder corn and hay, fodder corn and turnips, or turnips and hay, on the same ground in succession during the same season, the acreage of crops appears higher. The roots are mainly fed to the cattle and some to the

horses. The value of such as have no market price, as mangolds, is estimated. The turnips are rated much below the ordinary market price for table use. Yet at a rate which pays well enough for growing them. Should the market take them without too much cost for selling, a portion will be sold, otherwise they will all be fed to the cattle. The value of fodder corn has been estimated by means of a comparison with the cost of feeding the herd for a certain time on food which has a market price, so with the turnip and mangold tops. These prices do not affect the general result of the accounts when taken one year with another, as they are charged to the cattle account.

"Although the cattle account shows an apparent loss, it must be borne in mind, that it has to bear errors in valuation and of rough measurements, the cattle furnish a market for the various products on the spot, and furnish rich manure made largely of bran, &c., without the cost of drawing to the farm. I believe the introduction of Holsteins or Dutch cattle, will improve this account. My first purchase, a heifer, after her first calf, is milking seventeen quarts a day now. The cattle are soiled in summer, being only allowed to pasture on the aftermath when it is heavy.

"There is no charge for taxes or interest, nor for a portion of my own time given to superintendence. No doubt, increased efficiency of the labor would have amply paid for the whole time of a competent superintendent. Products consumed by farm laborers are charged to labor account; those consumed by carriage horses, or in our own family, are credited to the farm, as is any outside work executed by the farm men or teams. Seventeen acres of Fultz wheat yielded about 34 bushels to the acre, the balance of the wheat, some 13 bushels per acre, was a volunteer crop. The young timothy in the wheat of the preceding year was killed by the drought; the ground was plowed and reseeded; the wheat, although it had yielded some $39\frac{1}{2}$ bushels per acre, shelled so much besides on the ground, as to give this year 13 bushels per acre on 16 acres.

"When manure is applied to any crop, one-half its value is charged to that crop, and one-quarter to each of the two succeeding crops. The general expenses are added to each crop in proportion to its cost, so that every dollar expended is accounted for. The ledger account differs slightly from the account taken

from the crop book, because of a trifling difference between the inventory of December 31, 1876, and the actual receipts from the produce. Substantially the one account proves the other to be correct. Between 60 and 70 acres have been underdrained more or less thoroughly with round tile and collars. Horse shoe tile, the first used, 14 or 15 years ago, has proved worthless. Before this was done these wet clay lots, which will now yield 40 bushels of wheat per acre, were a burden on the rest of the farm, rarely, if ever, paying the cost of cultivation. The team account shows a profit, owing to almost constant occupation of the horses at farm and other work, and exceptional facilities for getting extra horses at a low rate when needed. This would somewhat reduce the cost of the crops; on the other hand the farm wages account shows a loss.

Result of Farm Operations for 1877.

From ledger balance of farm produce to credit. (This differs from crop book account, as it includes inventory both at beginning and end of year)	\$1,447 91
Balance of farm team account to credit, or profit on team service.....	642 88
	<hr/>
	\$2,090 79
Less balance to debit of farm wages.....	\$236 98
Less balance to debit of cattle account.....	373 18
	<hr/>
	610 16
	<hr/>
Net profits on farm operations.....	\$1,480 63

CROP ACCOUNT FOR 1877.

	Acres.	Crop.	Total cost.	Seed, labor and teams.	Manure value.	Returns.	Profit.	
783 bus, 17 acres, at 34 bus. per acre, 44 tons straw, and 16 acres volunteer crop 13 bush. per acre.....	33	Wheat.	\$865 28	\$596 78	\$268 50	\$1292 95	\$427 67	
90 tons and 60 days pasture, partly on 19 acres of clover, after oats.....	1½	Rye.	18 15	9 91	8 24	18 15	.....	Fed cattle, green.
1,129 bus, 28 loads straw.....	58½	Grass.	607 22	568 68	38 54	1260 00	652 78	
90 days feed and 16 loads in pit	26	Oats.	460 32	290 49	169 83	563 60	103 28	
387 bush and 3 loads tops.....	16½	Fodder corn.	536 76	366 51	170 25	716 50	179 74	
858 bush	1¼	Carrots.	144 16	123 16	21 00	125 75	.....	\$18.50 loss, soil too wet, many rotted.
2,496 bush. and 10 loads tops 1,134 bush. ears—680 bush., 26 loads stalks.....	4 ½ 4	Potatoes. Cabbage. Mangolds.	331 10 35 87 349 29	273 10 28 87 272 29	53 00 7 00 77 00	376 81 35 87 389 44	45 71 40 15	Used on farm taken at cost.
3,097 bush., 25 loads tops.....	12 10	Corn. Turnips.	457 09 378 27	362 09 332 49	95 00 45 78	486 00 484 67	28 91 106 40	
	166½		\$4183 51	\$3224 37	\$959 14	\$5749 74	\$1584 64	
							18 51	Loss off.
							\$1566 13	Profit.

150 acres in cultivation ; cost of crops, \$4,183.51 ; returns, \$5,749.74 ; net profit, \$1,566.13, or \$10.44 per acre.

STATEMENT OF CATTLE ACCOUNT—OUTCOME OF 1877.

Milk Account.

Outlay.		Income or Returns.	
Wages	\$562 13	Sales 71,471 qts. milk.....	\$3,019 54
Team service.....	390 57	6,452 qts. house, farm,	
Sundries	112 55	gardiner, &c	271 94
Bought feed, grain, meals, bran, oil meal, &c.....	1,620 18	Total 77,923	
Farm produce consumed.....	2,369 43	429 loads manure.....	858 00
		80 bbls. liquid manure.....	80 00
	\$5,054 86	Sales of 23 calves.....	29 45
			\$4,258 93

Stock Account.

Stock as January, 1877.		Stock as it is Jan. 1, 1878.	
25 Prime cows @ \$75.....	\$1,875 00	30 Prime cows @ \$75..	\$2,250 00
3 Old cows " 40.....	120 00	3 Old cows.....	70 00
2 Old cows	55 00	4 Heifers nearly two years old.....	200 00
5 Nearly 2 yrs. old heifers@\$50	250 00	5 Yearlings.....	125 00
3 Yearlings @ \$25.....	75 00	1 Bull	50 00
2 Calves " 15.....	30 00	3 Holsteins at cost....	774 25
1 Bull	75 00		
	\$2,480 00	46 Head.....	\$3,469 25
Add bought since—		Total cost.....	3,046 50
3 Holsteins.....	774 25	Credit difference in value of in- ventory being \$422.75 for nat- ural increase of 6 head, with- out reference to Holsteins and calves.....	422 75
1 Cow and calf, bgt. of Daily.....	80 00		
1 Cow from Mr. Carpenter.....	50 00	Total returns.....	\$4,681 68
	\$3,384 25	Outlay	5,054 86
Sold—			
2 Cows.....	\$55 00	Net loss on cattle account...	\$373 18
3 Cows.....	153 00		
2 Cows	129 75		
	337 75		
Total of 1877 stock.....	\$3,046 50		
Say 41 on hand 1st Jan.			
6 bought.			
47			
7 sold.			
40			

Through the favor of Jos. H. Bruere, of Princeton, the two following farm statements were received :

JOHN F. PHILLIPS, LAWRENCE, MERCER COUNTY,

States that his farm contains a little over 600 acres.
“The soil consists of about 400 acres of upland and something

more than 200 of meadow. The upland is sandy loam, with spots having a little gravel in, with clay subsoil of sufficient distance from the surface as not to need underdraining. The meadows are of a black, alluvial soil, from two to four feet deep, and have been reclaimed by embankments, so that they can be farmed as upland.

"The stock kept on the premises are 16 head of horses and mules for work and driving. From 40 to 50 head of cows are kept, which are bought and sold to suit the market. From 50 to 60 hogs are annually killed, and 100 breeding ewes are kept for raising lambs for the market.

"The past year there were:

	Bushels.
160 acres in corn, which yielded, of sound corn in ears.....	14,520
100 acres in oats, which are estimated to yield (not all having been threshed)	
near	5,000
75 acres in wheat, which will yield.....	2,000
32 acres of rye, which yielded over.....	700
15 acres of potatoes, which yielded over 100 bushels to the acre.	
9 acres of cabbage, which grew and yielded well.	
2 acres in melons.	
120 acres mowing ground for hay, which averaged about 1½ tons per acre	

"The rest of the land comprises orchard and pasture. There is not on the whole tract 5 acres that cannot be plowed. There are on the premises between 700 and 800 bearing standard pear trees, of the best varieties; about 1,000 apple trees, and 2,500 peach trees in the height of their bearing.

"The manures purchased are lime, stable manure and Pacific guano, which is found to do remarkably well drilled in with the wheat, and mixed with compost when used on corn and cabbage.

"The laborers employed are mostly single men, hired by the year and living in the house with the proprietor.

"For a number of years past a strict account of the value of the products sold has been kept and have averaged about \$10,000 yearly, some going over, others not quite so large, according to the value of products sold and according to the productiveness of the season.

"The crops are put in according to the general rotation of the country, the grass being left as long as it will do well. They are

cultivated, cut and gathered by the most approved machinery in use, the best being considered the cheapest in the end.

“Between three and four miles of hedge have been planted on the premises. It is of the honey locust variety, which with the proper care answers the purpose for turning stock, for which it was intended, and it makes a durable and handsome fence by proper attention.”

WM. A. HOUGH, EWING TOWNSHIP, MERCER COUNTY,

Has a “Farm of 160 acres; soil, a sandy loam on a clay subsoil; keeps 20 head of milch cows and heifers, selling them as fat, or for milkers, as seems best at the time; 8 head of horses and mules. About 30 acres are farmed to corn, followed by oats, and that crop by wheat. For the corn and wheat the ground is covered with stable manure, which is got in Trenton, in exchange for straw. Having followed this plan for a number of years the land is in the highest state of cultivation, and without paying cash for fertilizers. The crops this year are 2,000 bushels of corn, 700 bushels of wheat, 1,500 bushels of oats and 140 tons of hay. And the sales average \$4,000 a year. The expenses, or amount consumed, are estimated at \$3,000. Two laboring men are employed.”

MICHAEL TAYLOR, HOLMDEL, MONMOUTH COUNTY,

Writes as follows: “Yours of the 15th inst., asking me to contribute an article for the Board of Agriculture, on the Irish potato, was received. I fear my article will not be read with much interest, for they have been grown so extensively for so many years that almost all practical farmers are supposed to know as much about them as any other farmer could tell them; but, as you desire, I will give what information I can.

“As the prices have been for the past few years, there has been but little profit realized by raising the Irish potato. When we get large yields, and have marl (which I think is the best fertilizer for them,) on our farms, they can be raised with some profit; but where the soil is not well adapted to them without fertilizing it on purpose for this crop, it is better to raise many other

crops, especially if they have far to cart the potatoes, and high freight to pay in order to get them to market.

“Some years ago, farmers in this county did well by raising early potatoes. When we were sure of good prices—as from three to five dollars per barrel, and some years even higher—it paid well to manure heavy in the row, to bring them forward for the early market. But of late years they come from the South in such large quantities, and so much earlier than we can get them, that it does not pay to spend very much in rushing them forward. And since the Colorado beetle has troubled us, there has not been more than one-half the acreage of potatoes raised in this county that there was before.

“*As to the mode of cultivation*—We generally plant them on the ground which the year before we had corn on, as a leading to wheat and grass. We put our farm yard manure and marl on the ground, either separate or as a compost, before the ground is ploughed for the potatoes, but sometimes we put the marl on the grass two or three years before we plough it at all. We first harrow out the cornstalk stumps; then plough the ground with a two-horse plough; then harrow again until the ground is in good working order; then draw furrows for the potatoes, from three to four inches deep, and two feet nine inches apart, either with a sled or a one-horse plough. The ground is then ready for the reception of the potatoes, which have been cut in pieces, with one eye on each piece, and are now dropped by a boy or man into the furrows one foot apart; are then covered with two furrows thrown on them, with either a gang plough, or a one-horse plough; then just before coming up, the ridges are harrowed level by a light harrow with teeth close together; then just as they are coming through the ground two more furrows are thrown on them by a gang plough, or a one-horse plough, and, after a few days are again harrowed level by light harrow. This clears the weeds so that we have no hoeing to do. We then keep the ground in as good order, and as level as possible, until the vines come in blossom; then we throw a furrow up around them. The last few years it has become necessary to fight the potato bug. This is done by using Paris green and land plaster. I have experimented thoroughly with the quantity of Paris green necessary, and find that two pounds of Paris green to the one hundred pounds of plaster, kill them as thoroughly as to use

any more Paris green. We put it on by means of tin kettles, with perforated bottoms, which we give a shake over the plant. We first put it on after the last harrowing, just after the potato comes through, which is when the beetle first attacks them, as it is necessary to kill as many beetles as possible before they lay their eggs; and we repeat this as often as they appear thick enough to do any harm. The year of 1877, we put this mixture on five times, and thus kept them from doing any harm to the potato crop; while the potato vines are small, it is very little work, but as the vines become larger, it requires more of the mixture and takes a longer time to go over an acre. When the vines are about half grown, a man or a boy can go over two acres in one day. I used on a ten acre field about eighty pounds of Paris green and about twenty-two barrels of plaster. The cost of fighting the bug on the ten acre field, was for labor of men and boys, \$18.75; cost of plaster, \$22; cost of Paris green, \$24, making the whole cost, \$64.75. We find it advantageous to plant a quick growing potato, that we may have a short season to fight the bugs. The kinds generally planted are the Early Rose and Peerless. We find it best to renew our Early Rose seed every year, and get the seed from northern New York, Maine and Michigan. The Peerless seems to do quite as well to go four or five years without renewing.

“The cost of raising an *acre* of potatoes on this ten acre field, I fix at the following:

Two barrels of seed @ \$3.50.....	\$7 00
Planting and tending.....	6 00
Digging, putting in barrels and carting.....	17 00
Paris green.....	6 47
	<hr/>
Making cost per acre.....	\$36 47
Cost of ten acres, \$364.75	

“This ten acres yielded 1,120 barrels, or 112 barrels to the acre. They were carted from the field to the boat; sold in New York at an average of one dollar and seventeen cents a barrel,

Making total sales equal to.....	\$1,310 40
Commission 5 per cent. on gross sales.....	\$65 52
Freight per barrel from Keyport to New York, $12\frac{1}{2}$ (or $1120@12\frac{1}{2}$)	140 00
	<hr/>
For freight and commission added.....	205 52
	<hr/>
Whole amount on ten acres.....	\$1,104 88

“Amount on one acre \$110.48; deduct from this cost of raising; \$110.48—\$36.47=\$74.01, profit on one acre.

“There was put on this field farm yard manure, ten loads to the acre, this was put on in the spring and plowed under. Two years ago it was covered with marl at 100 loads per acre, dump wagon 12 bushels each. The yield for the year '77 was the largest that has been known in this county. Mr. Chryneyonce S. Holmes had a very large yield, six acres of Peerless, of which he kept an account,; averaged 155 barrels to the acre. Mr. Joseph H. Holmes had thirty acres of Peerless and Early Rose, which yielded about 100 barrels to the acre. This ten acres of ours was eight acres of Early Rose and two of Peerless, with but very little difference in the yield of the two kinds. These which I have mentioned were the very best yields; there were very few other farms which had an average yield of over 75 barrels to the acre. For this county with our facilities for getting to market, we think that it is best to plant our raw ground in potatoes, that we may have a rotation of crops. The usual time of planting potatoes here is the fore part of April.”

ISAAC G. SMOCK, HOLMDEL, MONMOUTH COUNTY,

Writes as follows, on wheat crops raised in 1876 and 1877:

“In the spring of 1873 I marled over a field of about eleven acres, then in sod. This was planted with corn in 1874. After the corn was taken off, nearly two-thirds of the field was covered by compost (of marl and barn-yard manure). In the spring of 1875 I planted potatoes, and the yield was good. After the potatoes were off the field was well harrowed and the wheat drilled in, two bushels per acre. It was sowed the 28th or 29th of September, and most of it was of the Fultz variety. In 1876 the yield was at the rate of thirty-three bushels to the acre. So much for one crop. In 1876 I sowed a part of another field with Fultz wheat. Sowing was October 5th. This ground had been in corn the year before, and had received a coat of barn-yard manure in the fall, after the corn was taken off. The yield was twenty-five bushels to the acre.”

JOHN F. WOODWARD, CREAM RIDGE, MONMOUTH COUNTY,

"I give you, with pleasure, as nearly a correct report as possible. I have not kept a strict account of everything. I have 160 acres of clay and sand loam.

"My crops are corn, wheat, rye and potatoes.

"*Fertilizers* used are, about 50 tons of marl and 400 bushels of lime each year.

"*Stock*.—I keep five horses, thirteen cows, forty sheep, and from twenty to twenty-five pigs are wintered. I raise the Jersey Sandy breed of hogs, and feed corn, corn meal, rye and swill.

"*Expenses* :

Fertilizers.....	\$125 00
Labor and other expenses.....	525 00
Grass seed.....	62 00

Total expenses..... \$712 00

"*Sales* :

This year I sold 23 hogs 21 months old, average weight 414 pounds ; 60	
pigs 8½ months old, average weight 235 pounds; total weight of 23,622	
pounds @ 5½ cents.....	\$1,228 34
500 pounds of lard @ 7 cents.....	35 00
150 bushels of potatoes @ 60 cents.....	90 00
100 bushels of wheat @ \$1.40.....	140 00
100 bushels of old rye @ \$1.00.....	100 00
11 calves, 200 pounds each, @ 6 cents.....	132 00
35 lambs @ \$3.50.....	122 50
Poultry.....	120 00

Total sales.....	\$1,957 84
Expenses	712 00

Profits \$1,251 84

WM. A. NEWELL'S STATEMENT.

"Complying with your request, recently repeated, I beg leave to give you herewith a statement concerning my farm. It is located in the western corner of the county of Monmouth, in the township of Upper Freehold, and contains about three hundred and twenty-five acres of land in a single tract, adjoining the village of Allentown, and extending eastward within a mile of the

Pemberton and Hightstown railroad. Three miles north lies the track of the Camden and Amboy road. The surface is loamy, with clay subsoil, and is free from sand, gravel, stone and clay. The buildings, of which there are three distinct and full sets, located with reference to a sub-division if needed, are very extensive, and built upon the north side of the road, affording a southern exposure. The fields are undulating, with a smooth surface, and face the south and west. Three hundred acres are upland, twenty-five peat meadow, thoroughly drained and traversed by a stream of pure spring water, six feet in width and a foot deep for a mile and a half in length, which affords water for the entire plantation. The fall is seventeen feet, and well adapted for the making of several fish ponds, of which there is one. Four acres of well timbered wood land and seven groves for shade comprise the entire forest growth. Four hundred apple trees of choice fruit, and twelve hundred standard pear trees, eighteen years old and free from blight, make up the orchards. Shade trees of chestnut, hickory and oak, of large growth, are numerous and well placed. I have subdivided my land into five enclosures of sixty acres. Corn, oats and wheat occupy one field, whilst two are retained for grass, one for hay, the other for early pasture.

“My practice is to apply about twenty loads to the acre of barn-yard manure to the corn field, plant about the middle of May, using the yellow gourd seed of this region, and plant four grains in a hill, five feet apart. I make no use of fertilizers for the hill, considering it to be injurious in case of a dry season and more likely to be infested with insects. I have never been troubled with any kind of corn worms, and am inclined to ascribe it to this fact. Using the Randall or wheel harrow for pulverizing before planting, I have seldom occasion to cultivate my corn more than twice. Indeed, I am constrained to believe that frequent ploughing on loamy land is far from being advantageous. The corn is cut before husking, thereby preventing the loss of leaves by the autumn winds and the ill effects of early frosts. Rye sowed in the corn field in August affords green pasture for swine, sheep and cattle during the winter and early spring, and is of the greatest benefit to the stock. Corn is followed by oats. The black side oat is the most prolific, the straw stouter and does not readily fall, and harvests ten days

later than the white variety. For some years past I have not ploughed my oat ground, but simply broken the raw ground with the culling harrow, eight acres a day with one team, sowing three bushels broadcast, and crossing with the same implement, saving time and labor. A roller is used after crossing to fix the seed and promote convenience in harvesting. Wheat follows oats. Having experimented with all the new varieties of the market, I have reached the conclusion deliberately and finally that the Red Chaff Mediterranean is the best variety for our time and latitude. I plow but once for wheat, thereby securing stubble pasture for my sheep and swine, and a large vegetable growth of grain, grass and weeds for the wheat crop. Having applied manure bone phosphate, or a domestic mixture of lime and peat, I drill carefully two bushels and one peck to the acre, running east and west if possible, so as to get the southern sun during the winter. Sowing is done during the last of September or the first of October. For two years I follow with grass using timothy and clover seeds, a bushel of each to six acres, or five acres, which is better if the ground is in good condition, and the wheat likely to grow so rank as to smother the tender grass. Potatoes are not a favorite crop with me, involving much labor and uncertainty in crops and price, and returning but an insignificant substance to the ground in return for the exhaustion which they occasion. A field of orchard grass is of unspeakable advantage to any farm, affording early, late, luxuriant and nutritious pasture. No farmer can afford to be without such a field. The average yield of corn may be placed at sixty-five, of wheat twenty, of rye twenty, of oats fifty, whilst the grass seed will give more than two tons to the acre. I have fertilized largely and for many years used bone phosphates, marl and lime, besides making a very large quantity of material from the barn-yard, having made it an inflexible rule not to sell hay, straw or corn stalks, but using these articles and much of my grain in feeding stock, which has consisted of sixty head of cattle, one hundred ewes, one hundred head of swine, large and small, and several hundred of poultry. The cows are not used for dairy, but to fatten veal, of which each good cow will probably make seven hundred pounds the season. I have resolved to discontinue the raising of lambs. Whilst the price obtained for them in years past is a great temptation, it is evident that as a

rule they are not so profitable as cattle or swine, being subject to more diseases, requiring greater care, more likely to meet with fatal accidents, and being destructive to vegetation of pasture. I have cultivated with great care a good cross of swine, having mixed the Berkshire, Essex, Magie and Jersey Red until a most excellent class-cross has been secured. I am quite confident that there is greater profit in raising large pork than in any other kind of live stock. The original stock is comparatively of little cost, and requires no cash outlay for its perpetuation. If increase fails the stock can still be utilized for fattening; the product is very large, being many hundred per cent. They are scavengers, and nothing nutritious escapes their greed; they make a large quantity of material for improvement, whilst fattening is going on in the pen; they take on two pounds of fat and muscle from the same amount of feed over any other animal; are easily cared for; are rarely subject to fatal diseases; are always saleable without searching a market at a certain season of the year when farming work is not especially pressing, and bring to the farmer a fair return in a single payment. It may be objected that the western production is overwhelming us. It is true that immense quantities are produced there, but the quality and size are not equal to Jersey stock, and we can always find a ready market and quick returns at the nearest depot. Poultry is profitable if properly cared for, but I have given little attention to that branch of the farming interest. My land was very much exhausted by severe cropping when it came into my possession, but I can now claim successful competition with any other plantation of like size, which is conducted in a plain, practical manner, and invite a certified comparison of product of crops and sales for the present year, dating from the beginning of the year. A friendly competition can only benefit all persons concerned, and help to advance the reputation of New Jersey."

ISAAC A. VAN HISE, BRICKSBURG, OCEAN COUNTY,

writes: "In compliance with your request to furnish some items in reference to the agricultural interests of this section of the State, I submit some thoughts, though perhaps not of very much importance. So far as I have observed, the farmers in this sec-

tion have not of late made any very great changes in their mode of cultivating the soil or the size of farms cultivated. The latter is more or less governed by the means or ability of the farmer to purchase and cultivate large or small tracts. I think great mistakes are often made in attempting to cultivate more land than can be properly fertilized to render it productive. If the same quantity of manure and other fertilizers that are usually spread out over a farm of one hundred acres was concentrated on one of fifty acres, about the same results might be attained as to quantity of products raised, and evidently at a saving of nearly fifty per cent. in labor or cost of cultivation, to say nothing of the original outlay in the purchase and clearing of the additional quantity of land. As to the nature and quality of our soils, they may be properly named or divided into two classes, and probably in about equal quantities, one portion of which is sandy, not so productive, nor attractive in appearance, the other portion being a clay or sandy loam, underlaid with a stronger mixture of clay. In clearing up new lands this latter class is usually selected as being the most productive. In fact this quality of soil, if fertilized to the same extent that some lands are in other portions of the State where they have heavy clay soils, I am quite sure that we could equal, if not excel, them in production. A fair comparison will show that this land will stand the drought better than heavy clay land, as it does not bake and become hard on the surface, thus preventing it from absorbing and retaining the moisture. Small fruits do well here, but farmers are turning their attention more to the raising of general grain crops, finding this quite as profitable, beside rendering themselves more independent from pursuing this course. Corn, rye and most other grains do well here. Especial mention might be made of sweet and round potatoes, which are almost natural to our soils, and the quality of which far surpasses those grown on heavy clay soils, being dry and mealy. One fact might be mentioned as to the mode of farming, and that is the matter of deep plowing. This was quite in vogue with us a few years ago, as was also that of plowing under manures, the deeper the better so considered. This I think is a great mistake, as it is very evident that better results are obtained from top dressing, as by this mode the manure more readily comes in contact with the roots of plants, and is thereby at once taken up by them. In

fact, I believe that if some plan could be devised by which the soil could be thoroughly stirred and pulverized to a proper depth, without being turned over at all, it would be found to be an advantage, as Nature seems to exert herself at once to again bring the better soil to the surface after being plowed under to any great depth.

“The kinds of fertilizers used in this section are principally marl and lime, mostly the former, which can be had in any quantities, delivered at the various railroad stations, at from one dollar twenty to one dollar and fifty cents per ton. This is usually spread during the winter on meadow or other lands intended for mowing. It is also largely used in the cultivation of sweet and round potatoes. Mention might also be made of a fertilizer brought here from New York, known as glue waste. This can be delivered here at about ten dollars per ton. It is found to be an excellent fertilizer for most crops. Farmers in this section are turning their attention more to the raising of stock. This has been generally too much neglected. It is not only a source of profit in itself, but the farmer is enabled by this means to obtain on his own farm a good supply of manure, which cannot be excelled, if equaled, by any other fertilizer used. The Alderney breed of cattle are the most prized, being the best milkers; and altogether considered the most desirable. Another product (although not properly a farm product) of which this part of New Jersey may lay claim to the monopoly, might be mentioned, and that is the cranberry, but so much has been written, and so many experiments have been made, and results given to the public by those better qualified than myself to speak, it may be superfluous in me to refer to it. However, I would say that notwithstanding the partial failure of this branch of industry, caused by what is known as the rot or scald, those who have invested largely and are engaged in its culture, are quite sanguine of ultimate success, being satisfied that the difficulty is only temporary, and will in due time be understood and overcome.”

A. S. MACBEON, OF BRICKSBURG, OCEAN COUNTY,

occupies a fruit farm of 16 acres, located near the road from that place to Toms River, and on the high ground of Southern New

Jersey. The land had been for many years connected with the Bergen Iron Works, and had never been cleared till he took possession of it ten years ago. He has gone through the usual disappointments which attend the first efforts to raise strawberries and other small fruits for market, and the failure of his grape crop from the rot. And now with the confidence which comes from experience in farming, and vigorous health, re-established in that salubrious climate, he writes his statement of the staple crops grown on his farm, and of his plan for the management of that heretofore unpromising soil, as follows :

“ We have gone considerably into general farming. Last year I grew four acres of corn, an acre of sweet potatoes, half an acre of round potatoes, an acre of asparagus, two acres of strawberries, an acre of blackberries, one acre of grapes (having grubbed out two acres the year previous). I have also about three acres in orchard—apples, pears, &c. I have only sixteen acres of land cleared. My corn yielded as high as one hundred and five bushels of ears to the acre. For fertilizers I used one ton of hair manure, spread broadcast on a crop of rye, sowed the previous fall, on corn stubble and plowed under, and one hundred pounds of superphosphate and one hundred pounds of plaster mixed and put in the hill, to the acre. The result was a good crop of corn and fodder, the latter fully paying for the fertilizers, as previous to this I had to go ten miles to the salt meadows for salt hay, a worthless article for any farmer to use. So we can now appreciate good fodder. My sweet potato crop was about two hundred and forty bushels, small and large (not yet sold). Round potatoes, thirty bushels. My asparagus sold for about \$60. Strawberries sold very low last year. Blackberries yielded poorly, and the grapes were an entire failure. My pear trees begin to bear, and yielded a few crates.

“ My soil is a yellow, loamy sand, as good as any hereabouts, and responds quickly to little manuring. It is dry and pleasant to handle and easily worked. For fertilizers the last few years I have used all that I can make from one team, one cow, and occasionally a pig supplemented. With Peter Cooper’s glue waste, or hair manure, bone and acid I have made a superphosphate which gave me great satisfaction. I have also a greenhouse, in which I grow grapes and plants, the latter for local sale. The grapes are “Black Hamburgs” and “White

Syrians," and are sent to New York. One bunch of the latter weighed six and a quarter pounds, which my commission merchant wrote me, took the first prize at the American Institute Fair.

"The labor on the place, including the building of a house 40x40, a barn 30x30, and greenhouses and out buildings, &c., has all been done by myself and my two boys (still in their teens.)

"We are hoping for better times for this section of country, which is new and rough, but as it is close to the shore, which is fast filling with villages, and lying between the two largest cities and markets on the continent, and with the prospect of additional railroads and improvements always in view, it cannot fail to be yet a prosperous section of this small, but well located and rich State of New Jersey.

"In conclusion, allow me to say that I have derived much pleasure, and perhaps some profit, in looking over the experiments on different fertilizers as carried on at the College Farm; but as a citizen of the State, and one occupying just such land as perhaps covers one-third, or more, of New Jersey, we are entitled, I think, to the paternal care of our government, to the extension at least of an experimental station carried on in this section and on our kind of soil and for our own benefit. Experiments on land which naturally yields 80 bushels of corn to the acre, can be of little use to us here."

HON. WILLIAM PARRY, OF CINNAMINSON, BURLINGTON COUNTY,

Writes with reference to wheat crops in his neighborhood, as follows: "We do not sow wheat every year; had none since 1876. That year we had six acres of Fultz wheat, which yielded 40 bushels to the acre, 240 bushels. The ground had been in strawberries; no manure for more than a year previous; the strawberry plants were plowed under during summer and about 1,500 pounds of hair manure applied to the acre, thoroughly cultivated, and the latter part of September about one and a half bushels of Fultz wheat sown per acre.

"My neighbor adjoining me, Heulings Lippincott, had that year (1876) seven acres of Fultz wheat which yielded 45 bushels per acre, 315 bushels. The ground was well coated with stable

manure for potatoes in the spring of 1875; no more manure was applied after the potatoes were removed for the wheat. The past year (1877) the same person, Heulings Lippincott, had 12 acres of Fultz wheat which yielded 31 bushels per acre, 372 bushels. Manure (stable) was applied for potatoes and corn in the spring of 1876, but no more fertilizer in the fall for the wheat; sowed October 1st.

“Elwood Griscom, another farmer adjoining me, had, in 1877, fourteen acres of Fultz wheat which yielded 31 bushels per acre, 434 bushels; had oats on the same ground 1876; applied a coat of stable manure before sowing the wheat—about 1st of October.

“Benjamin Gillingham, another neighbor, adjoining Heulings Lippincott, had, in 1877, twelve acres of Fultz wheat that yielded at the rate of 37 bushels per acre, 444 bushels. Stable manure was applied in the spring broadcast for potatoes; no more for wheat; sowed last week in September.

“Clayton Conrow, residing near by, in this township, had, in 1877, fifteen acres of Fultz wheat that yielded 31 bushels per acre, 465 bushels. Stable manure was applied in the spring before planting the potatoes and tomatoes; no more was applied after the potatoes, but there was after the tomatoes, before sowing the wheat. And it proved advantageous as the wheat was better where the tomatoes grew. A part was sowed on the 2d and the rest on the 9th of October. The latter yielded the best. The grain was sowed broadcast and worked in with a Randal harrow, having circular wheels to cut and pulverize the soil.

“Wm. R. Lippincott, adjoining me, had twenty-eight acres which produced 850 bushels, rather more than 30 bushels per acre. Stable manure was spread and plowed in with the wheat, which was sowed about the first of October.

“Our usual time of sowing here is the last week in September and the first week in October.”

Through the favor of Chalkley Albertson, of Haddonfield, the following statement of

VAN BUREN GRIFFIN, KIRKWOOD, CAMDEN COUNTY,

Was obtained: “Through the request of your friend, Chalkley Albertson, I very reluctantly endeavor to give you a correct

statement of our farming operations during the year just closed, which has been of the most unfavorable character, as regards prices received for most of the perishable crops, and therefore a poor criterion and not so pleasant to report.

"The farm we occupy contains 143 acres, of which about 30 acres is hillsides and woodland. It is in a good state of cultivation. Again and again, and very recently, too, \$20,000 has been refused for it.

"The soil is generally loamy, with clay or gravel subsoil. A part of it is *very* stiff clay. A large portion is underlaid by marl.

"The leading products are corn, wheat, rye, hay, potatoes, cabbage and tomatoes. Of course, we endeavor to have a good garden, which P. T. Quinn thinks so essential to successful farming.

A tract of 16 acres in corn produced at the rate of nearly 60 bushels per acre, or 900 bushels. Am satisfied we lost 10 bushels per acre by using a new machine and drilling it in rows. This is mostly used in the Western States. We shall return to our former mode of planting, in hills, $4\frac{1}{2}$ feet apart each way, using marl, hog manure and guano in the hill.

"Wheat on 13 acres amounted to 363 bushels, or 28 bushels per acre.

"Rye on 4 acres returned 85 bushels.

"Oats on 5 acres, 200 bushels.

"I do not think it is possible to make oats a paying crop with us.

"The hay crop was not so good as it generally is here. In round numbers we sell to the amount of \$300, besides feeding to 5 horses, 22 head of horned cattle and 50 sheep.

"Potatoes of the Early Rose variety, on 12 acres returned 4,500 baskets, which brought, on the average, 25 cents a basket, or \$1,100. We lost at least 500 bushels by the rot. (These returns are after the commission was deducted).

"16,000 heads of cabbage were sold from 5 acres, at an average price of \$2, one-third, at least, was lost by the rot.

"The amount returned for tomatoes, sugar corn, &c., was \$360.

"Our dairy, consisting of 14 milch cows, returned \$840, or \$60 a head.

"We raise our own stock of hogs, and have a good stock for the

coming year, besides selling \$95 worth of pork, and tubbing enough for the year. On stock fattened (sheep and cattle) we will clear \$150. No corn is sold off the place. In raising poultry the disease has baffled us so that we do not make any specialty of it. The returns from it are \$145.

“The above returns embrace nearly all the income of the past year. Of course, the products of the dairy, the vegetables, &c., consumed by the family are not included.

“We employ two men the whole year, and one additional for eight months. They are paid from \$10 to \$16 a month. Including the wages of the house girl and all the extra help, we have paid out nearly \$600. The guano, plaster, bone and lime have cost \$246.

“We have not taken into account our own time and labor nor the interest on valuation of farm and stock and implements, nor the wear and tear of the implements and the expenses of keeping up repairs.”

“By deducting what wheat is necessary for sowing and family use, and the rye and oats needed for stock, we sum up accounts as follows :

RECEIPTS.

Wheat	\$450 00
Potatoes	1,100 00
Cabbage	320 00
Tomatoes, &c.....	360 00
Dairy.....	840 00
Hogs.....	95 00
Poultry.....	145 00
Profits on fattened stock.....	150 00
	<hr/>
	\$3,460 00

EXPENDITURES.

Labor	\$600 00
Fertilizers.....	246 00
Groceries.....	150 00
Clothing and incidentals.....	260 00
Wear and tear of farm	100 00
Interest at 6 per cent. on value of farm and stock.....	1,380 00
Toll and ferriage.....	100 00
	<hr/>
	\$2,836 00
	<hr/>
Balance in my favor.....	\$624 00

HON. ANDREW K. HAY, WINSLOW, CAMDEN COUNTY,

Occupies a farm of 800 acres, on the elevated ground in the central part of Southern New Jersey. It has been considered to be in the pine region of the State, and was not cleared up until Mr. Hay commenced glass manufacturing there. The needs of the families living at the works, and the teams to be kept there, have led him to clear up and farm the land. And the crops of corn, wheat and hay raised on this soil are as good as those in other parts of the State. He reports the corn crop of 1877 at 5,000 bushels, the wheat crop 1,780 bushels, and the hay, which is clover and timothy, at 375 tons. No statement is given of the potatoes and other smaller crops, or of the stock of horses, cattle and swine. The profits of such a farm are largely intermixed with those of the other departments of the glass works, but the crops are certainly pleasing to those who see them, and they appear to be satisfactory to the owner, and they prove the soil to be well adapted to cultivation.

HON. R. J. BYRNES, HAMMONTON, ATLANTIC COUNTY,

Writes: "Considerable attention has been directed to the grape at this place, as also in this county; hundreds of acres have been planted and, until a few years ago, with very discouraging results. The Catawba, which was the popular field grape, and the Delaware failed completely, after one or two crops. Diana, Hartford, Union Village, Elsinburg, Franklin, Norton's Virginia, and other varieties have been planted in small lots. The Concord is the only grape we have retained, and is our chief market and wine grape. Ives' Seedling has been in bearing five years, and promises to be hardy and valuable, and can be marketed before Concord and at better prices. Many acres are being planted with it. The wine makers are experimenting with other varieties, which as yet are nothing as field crops, but are valuable in mixing with the Concord in making wines of different character. One of the most noted is the Franklin, which, in the hands of some of the wine makers has attracted considerable attention. The other grapes are Herbemont, Clinton, Taylor, Martha and Creveling. There are about 900 acres in grapes in this county, 850 acres are Concords. The product of an acre in good condition

and season is from 6,000 to 10,000 pounds. Mr. J. O. Ransom, of Hammonton, marketed last season 5,000 pounds from five-eighths of an acre of Ives' Seedling. The prices vary from four to ten cents a pound. The wine makers buy up grapes not marketable, at from two to three cents a pound. The great enemy of the grape is the "rot" as it is called, a disease that has baffled all attempts at its remedy as yet applied by the farmer, and we implore science to come to our aid. The rot disfigures the fine clusters for market, and sometimes whole vineyards are lost.

"The grape as it grows in this section, when free from disease, is luscious and showy. There is no place in the Middle, Northern or Western States where it arrives at such perfection. The climate and soil seem particularly adapted for its development. Were it not for the rot that spoils its bunches, it would be the most profitable, as well as beautiful, of all our productions. As it is, it amply pays skill and labor. In consequence of this disease rendering the grapes unsaleable, we are compelled to turn them into wine, which is now a very large industry in this country, and has already attracted considerable attention. Commissioners (attending the Centennial) from Portugal, Italy, Spain and France have told me that the wines drank at Egg Harbor City, in this county, were as pure and fine as any of the same varieties in their own countries, which are imported in such large quantities (and much of it is adulterated) at three times the price we can buy them pure at our own door. These wines age to perfect satisfaction, and are really very fine. The white wines are made from the Martha, Catawba and Delaware; the red wines from the Concord and the grapes above mentioned. They are sold at from one dollar to three dollars per gallon, according to age. The production of wine is from 50 to 250 gallons per acre, according to the season or disease. The wine is finding a market, and those who have already a reputation are making plenty of money. All are encouraged, and gradually (not many years hence) this whole county will be wine producing, rivaling the famous Medoc and red Burgundies of France.

"The soil best adapted to the grape for wine is the sandy and gravelly loam, which is the character of most of the upland in the county.

"The mode of preparation of the land for grapes has been the same as for corn, but within the last eight years a large number

of Italians have located and have succeeded so well that we are adopting their plan, which is to trench, or dig the land to the depth of 2 or 3 feet, putting the top soil in the bottom, with all the rubbish, brush, leather scraps from our shoe factories, or anything they can obtain. They then plant one year old roots 6x8, 8x8, 8x10, or 10x10 feet. The roots are put in deep and covered up gradually so that they will root well in the ground, not allowing in after cultivation the roots to come near the surface. The growth of wood by this process is strong and healthy; the land is kept clean. The training is to stakes, or trellis, as they fancy. Most of them grow the grapes on new canes, or what is known by the renewal, others prune to two or three eyes. If grown for wine, summer pruning, pinching off laterals is attended to, if for market fruit, not so much pruning is done, no wood is allowed to grow but that bearing fruit, or that for next year's fruiting. This mode of preparing the soil is being practiced by the Germans at Egg Harbor City and it is said much finer wine is produced."

VALENTINE P. HOFMANN, SECRETARY OF THE EGG HARBOR CITY
AGRICULTURAL SOCIETY, ATLANTIC COUNTY,

Reports, "Under the auspices of our society a census was taken last autumn to elicit the number of acres of cleared land in vineyards, of horses, cattle, &c., in our settlement, which comprises an area of over 30,000 acres, including all of Egg Harbor City and parts of Galloway, Mullica and Hamilton townships. It was ascertained that we have about,

 "2,350 acres of cultivated land.

 615 acres of vineyards.

 10 acres of small fruits.

23,300 fruit trees of all varieties.

130 horses.

73 mules.

326 milch cows.

138 head of other cattle.

403 swine.

"The year 1877 was very unfavorable to our grape crop. At the beginning of the season it promised to yield the greatest crop ever gathered. About the middle, and at the end of the

season, the grape rot made its appearance to an alarming extent, all the leading varieties of grapes being more or less affected, especially those of the Labrusca class. As to the cause of the rot opinions are divided, some averring that a too close pruning of the young shoots in the early season was the cause, as by this method the vines were surcharged by an over excess of juice, which those vines could not assimilate and, in consequence, the fruit was attacked. The month of June, and the early part of July, supplying us with an unusual excess of moisture, and as the rot made its appearance during and subsequent to this time, it is believed that atmospheric influences were the main spring of this evil.

“Despite these drawbacks I can report, from authentic sources, that 1,500 tons of grapes were sent to market; about 100,000 gallons of wine were made, and the total grape crop harvested amounted to not less than 5,200,000 pounds. The average price obtained for grapes was three to four cents per pound.”

WM. O. H. GWYNNETH, VINELAND, CUMBERLAND COUNTY,

Writes, “The rise and progress of Vineland can hardly be realized by our oldest inhabitants.

“To see Vineland now with its 150 miles of good roads, its farms, vineyards, orchards, churches, stores, markets, manufactories, in fact, everything that enters into a high order of civil and social life, and contrast it with the forest and dense underbrush which fifteen years ago occupied its place, to say the least, is a wonderful change.

“The mildness of the climate, purity of the water and capabilities of its soil, in connection with its before-mentioned advantages, render it a place of no meagre attractions.

“Although its soil and climate make it peculiarly adapted to fruit growing, yet the production of the staple crops will, per acre, compare favorably with those of any other section in this latitude.

“The prominent agricultural industry is fruit growing, and the leading branch of it is grape growing. There are about 1,000 acres in vines, and two-thirds of the vines are in bearing, the other third not being old enough. The crop this past season was not as profitable as heretofore, owing to the universal pre-

valence of the rot. This was the first year of its appearance to any extent in Vineland. Very minute microscopic examinations and experiments with the fungus were made by Dr. Bidwell and Col. Parson. The results and their views have been published in our papers, and no doubt but that our vineyardists will be prepared to ward off the disease if it should hereafter make its appearance.

“The largest proportion of our grapes are sent to the markets of Philadelphia, New York and Boston.

“The packages most generally used are two and three-pound paper boxes, packed in crates. A wine company has been established here, which buys large quantities of grapes. They have recently enlarged their vaults and machinery.

“The next fruit of importance grown here is the blackberry. It is estimated that there is at least 1,000 acres under cultivation. Probably three-quarters of them will be in fruit this season. The acreage will be largely increased this year, as many intend putting out from one to ten acres. No pest has as yet infested the bushes to any extent, and the prices obtained for the fruit, in proportion to cost of production, have been very satisfactory. The fruit is sent to the same markets as the grape, but in pint and quart wooden boxes, packed in chests, holding from twenty-four to sixty quarts.

“Peaches occupy the third place in our fruit growing and there are from 800 to 1,000 acres devoted to this crop. With some growers this crop has been highly satisfactory, both as regards price and the quantity produced. All the most desirable of the older varieties, and many of those of recent introduction are grown. As a general rule the later kinds have brought the best prices. There is no canning establishment here, and the crop is sent to the cities before mentioned. Our packages are the one bushel crates.

“Pear growing is receiving considerable attention, and there are probably 500 acres in this fruit. The success of different growers is perhaps more varied than with any other fruit. Some have obtained highly satisfactory results while with others there has been failure. No doubt in many instances of failure, it is the result of planting varieties that will not succeed, except under the most favorable circumstances. With proper selection of kinds, judicious culture and attention, this fruit can be grown as successfully as

any of the others. The packages for marketing are the same kind as of the peach.

"Strawberries are not grown to much extent, and there are, probably, 200 acres in this fruit. Formerly they were grown largely, and from four to six car loads a day for several consecutive days, have been shipped from here. A few years ago the business got so completely overdone that our growers very generally abandoned its cultivation, and turned their attention to the blackberry. We send the crop to the same markets as before mentioned, and in the same kind of packages as for the blackberry.

"Raspberries are not generally grown. And it is estimated that there are only 100 acres devoted to this fruit. Our distance from the markets and the fruit being so tender, the prices have not been sufficiently remunerative for our growers to consider their production any object.

"Apples have not yet been largely planted out, but the trees that are old enough have fruited very satisfactorily. The varieties which succeed best as far as tested, are not very numerous. Many more trees will probably come into fruit this season. And it is confidently believed that this fruit will be a success.

"Of the more staple crops, sweet potatoes occupy an important place. It is variously estimated that last season from 30,000 to 40,000 bushels were raised. In planting out both the hill and drill system is pursued, each having its advocates. A large part of the crop is shipped to market when first dug. The balance is stored for home consumption and early spring shipment.

"The round, or Irish potato, forms quite an important article of production. As near as can be ascertained there were about 10,000 bushels grown last season, notwithstanding the Colorado beetle was very destructive. This crop is consumed at home.

"Corn forms one of the most important crops. It is estimated that from 600 to 800 acres were in corn the past season. The yield per acre varying largely according to cultivation, fertility, &c. Some fields yielded 75 bushels of shelled corn, others not over 25 bushels per acre. A fair average would undoubtedly be from 35 to 40 bushels.

"Wheat is grown by a few only and probably the acreage is altogether 150 acres. The varieties are Clawson, Fultz, Tappahannock and Red Mediterranean. The yield this past season

was not as large as heretofore, from 12 to 20 bushels, and a fair average 15 or 16 bushels per acre.

“Rye, barley, oats and buckwheat are grown occasionally.

“The hay crop is assuming more importance year after year. From 400 to 600 acres were in grass this past season. The average yield per acre was from 1 to $1\frac{1}{4}$ tons.

“It will be noticed that we have a small acreage in staple crops. Most of the settlers have small farms, very many of the holdings being from 5 to 10 acres. On such the production of fruit is the main object. Only a few, who have enough to have a rotation, have attempted to raise staple crops.

“Of stock there has scarcely been any attempt towards production or improvement. Most generally a horse and cow are kept—as also a shoat or two—and many fowls. The properties are too small to make stock raising profitable, or hardly possible.

“As to fertilizers, fruit growers use flour of bone, lime and muck, but in limited quantities. Those raising the staple crops use Allentown and Lister’s bone, both of which are highly approved. Also shell lime, muck and marl.

“We use the greensand marl from the West Jersey Marl and Transportation Company’s pits. On such crops as clover, oats and round potatoes the marl is highly beneficial. The price here prevents many from using it, who would like to do so.”

Through the favor of Omar Borton, Esq., President of the West Jersey Agricultural and Horticultural Society, the following two statements were obtained:

JAMES ABBOTT, PILESGROVE, SALEM COUNTY.

“1. Size of farm; 150 acres; unimproved, 15 acres.

“2. Soil, dark loam, stands drought well.

“3. Crops grown: wheat to acre, 25 bushels; corn, 65 bushels; potatoes, Irish, 125 bushels; hay, $2\frac{1}{2}$ tons.

4. “For wheat, plow deep, and get the ground in good condition and drill in about 1st October; for corn, plow deep and plow about 1st of March, and plant about last of April; for potatoes, plow ground twice and manure and marl heavy the first plowing. Fertilizers used, marl and manure.

“We make about 400 loads of manure, and use about 200 loads of marl. We have marl on the farm.

Cost of raising crops about.....	\$400 00
Sales off of the farm about.....	3,000 00

“Stock—6 horses, 5 cows, 20 head of steers, 20 hogs.

Cost of stock and keeping	\$1,500
Sales.....	2,000

“This farm is about one mile west of Woodstown, on Salem road, and belongs to ex-sheriff John Hunt. Mr. Abbott farming to shares.”

WM. M. COLES, PILESGROVE, SALEM COUNTY.

1. Size of farm 140 acres; under cultivation 120 acres.
2. Light loam, clay subsoil.
3. Grass, corn, oats, Irish potatoes.
4. First year, corn; second, corn, oats, potatoes, followed by wheat sown with grass seed.
5. Barn yard manure, marl, lime, some fertilizers.
- 6 Cost of raising crops, no report.
7. Yield, corn, 60; oats, 40; Irish potatoes, 100; wheat, 20 bushels per acre; grass 2 tons, per acre.
8. Sales and profits, no report.
9. Keeps 15 or 16 cows, and makes 10,000 pounds pork.
10. Cost of keeping stock, no report.
11. Profits of stock, no report.
12. Some fruit, but not much profit therefrom outside of family use.

The above farm is two and a half miles east of Woodstown.

The two papers following, were sent by the Woodbury Grange, Gloucester county :

A DESCRIPTION OF THE CULTIVATION OF SWEET POTATOES, AND
THE DISEASES TO WHICH THEY ARE LIABLE.

- “1. It is of the utmost importance to procure good quality of

seed ; next to keep them warm and dry through the winter (temperature, 60°).

2. To place the potatoes in hot beds for sprouting. Make the beds of some good manure in sufficient depth to cause a fermenting heat, not to exceed 80° ; cover with from three to five inches of earth ; lay on the potatoes so as not to touch each other, and cover with from two to three inches of earth. Care must be taken to avoid extremes of heat or cold, as well as of moisture and drought, as this is thought to be a fertile cause of the black rot.

The most of the above can be controlled by proper care. But the subject that has baffled the potato growers is how to prevent the ground rot—as it is called—and here, I do not feel equal to the task. I know nothing of the real cause of the disease of the potatoes, but its effect on the potatoes is powerful. I have known potatoes planted for twenty years on the same piece of ground, and the crop improve ; which would seem to say that the sweet potato is not very exhausting to the soil, but of late years, whole sections of what was potato land is now worthless for raising that crop. But as this is the subject now most under discussion, I will give my observations on it.

1. It (the disease) almost always attacks the potato in the warmest and driest part of the field. First only a few hills of the plant are injured, and the very next year the whole field is ruined, so rapid is its spread. I have carefully examined some of the diseased potatoes with a magnifying glass, and discovered numerous insects that have the shape of the common earth worm, and of almost transparent appearance.

I have omitted to mention the kind of manure mostly used to grow the potato, and will say that well decomposed manure of horses is considered the best by most farmers.

The best locality for their successful culture, is new land, or that from which the timber has lately been removed. I have several such clearings, and it is remarkable how marked is the difference between old and new land—to the very row the first year, and remain so for several years. But after a while the disease will gradually encroach on the new field.

One thing I must not omit to mention—a field on which there was spread four hundred pounds of bone dust to the acre, and as yet no disease has made its appearance ; and the more remarkable as the adjoining fields are badly injured with rot. I ask

the question of any one, if in their experience, they know any similar case?

I will mention one more case that does not look as if it was the continuous planting of the potato in the same place that accelerated the rot. I once saw 14 hills in one of my patches that dried up entirely after they had started vines three feet long. There was a tree struck by lightning close by, and I thought the 14 hills had been hurt by the same. But that fall I sowed the field to winter grain, followed with grass; rested it in sward two years, then planted it in corn, followed the next year with potatoes and corn. My lightning turned out to be the potato disease on more than an acre in extent. This was about the beginning of the rot on my farm. Since that I have not been deceived with lightning. Its effect (the rot) is too well known. I might mention that I have seen potatoes after planting start nicely and continue to grow in the early part of the year, while the earth was sufficiently moist and cool. But when dry weather sets in for a few days, and then a thunder gust is followed by hot sun, they would at once commence to burn up.

And now after writing so much on the subject, I quit where I began, that the cause of the disease is little known."

" THE CULTIVATION OF SWEET POTATOES, THEIR ENEMIES AND
DISEASES.

Of late years the production of sweet potatoes in this State has greatly increased, until it has become enormous.

Its cultivation was for some time confined to the light soils lying along the river Delaware, but has now been extended over more or less of all the centre and southern counties of the State. When it was first introduced here it was thought they could not be grown on any but light soils, but it has since been discovered that as large, if not larger crops, can be produced on land where clay predominates. But the stiffer the soil the poorer is the quality of the potatoes; more watery, and not so sweet. It was at first thought that so much labor was necessary in their cultivation, that a "patch" of 5,000 hills was considered quite large, but now the labor of raising them has been so reduced that it is no uncommon thing for "patches" of 100,000 hills and upwards, to be raised on one farm. The early growers of this vicinity

adopted the plan pursued in the Southern States, that of planting the potato in the hill, but it was soon found that this plan would not answer, the season here being too short.

The method since adopted, and now in general practice, is to make a hot or forcing bed in the spring, about the last week in March or the first week in April, in which the seed potatoes are placed, in order to obtain sprouts for transplanting in the field. The most suitable place for the bed is one having a southern exposure, with the ground naturally descending towards the south, with a natural or artificial wind break at the north and west. There are two kinds of beds now in practical use, one in which the heat is produced by horse manure, the other is built with a furnace, with flues attached running lengthwise of the bed, and the heat is produced by the use of coal or wood. Both plans seem to answer the purpose equally well, the only question for the "trucker" to decide is, which is the most economical. When it is decided to heat the bed with horse manure, the place being selected as above stated, a trench is dug 15 or 16 inches deep and 6 or 7 feet wide, and long as is necessary to hold the potatoes designed being placed in it, which should be a basket for every 1,000 sprouts required.

Around the inside of this trench should be placed a frame of cheap boards 8 inches above the level of the ground, banking the earth up against it. In this trench is generally first placed a layer of corn stalks or old hay (the former I think preferable), to the depth of 4 or 6 inches, which should be well dampened; then the manure is placed in to the depth of about 15 inches, using the kind best calculated to produce heat, and should be in a high state of fermentation when it is placed in the bed. The manure should be placed in loosely, merely pressing the surface sufficiently to level it, in order to place the dirt upon it evenly, which should be about 3 inches deep. I think it is important that the earth used for this purpose should be rich, so as to insure a vigorous rooting of the potatoes. After the earth is placed upon the manure, it must be covered with hay sufficiently thick to prevent the heat from escaping too rapidly, and over this should be made a roof of boards or some other material, to shed the rains. In this condition it should remain 5 or 6 days, when it will be in a proper condition for placing the potatoes in, the strongest of the heat having passed off.

A warm, sunny day is generally desired for this work, so as not to cool the bed too much. The potatoes should be lightly pressed into the earth as they are being placed, to keep them from being displaced when the dirt is thrown upon them, which should be two and one-half inches deep. The potatoes should be placed far enough apart to allow them to swell without interfering with each other. In about ten days the sprouts should be up, when the covering should be removed every day when the sun shines, to give them air and light. Truckers sometimes have trouble in procuring the number of sprouts they require, on account of their beds doing badly. A great many are in the habit of placing their potatoes in the beds the same day they put the manure in, which is the great cause of their trouble. The first heat of the manure is too strong for the potatoes, often causing them to rot badly (which is termed amongst truckers, burning the bed), and if they do not rot, so much of their vitality is destroyed that they will not sprout well. The same principle applies to sprouting potatoes that applies to baking bread—it should be done with a declining heat. I have been thus minute in describing my method of making a potato bed, because it has always been successful with me, and I know there is scarcely a spring passes but what some meet with a partial or total loss of their beds, because they have not made or managed them properly. I have not had any experience in heating beds by furnaces with flues attached; those that have tell me they like them very well, better than beds heated with manure, because they can regulate the heat to suit themselves, and in the end no more expensive.

Potato growers differ in regard to the depth necessary to plow the ground; some think it is not necessary to plow light land at all, others that it should be plowed shallow; while some think it does no hurt to turn up some of the subsoil. I incline to the latter opinion. I know of instances where the subsoil has been hauled and spread over the surface, which largely increased the yield. I think heavy land should be plowed shallow, although I have not had much experience in growing potatoes on such soils.

When the ground is properly prepared rows are run with the plow about 2 feet 7 inches apart, just wide enough for a cart to track in them easily, with the horse walking in one furrow.

These furrows should be crossed with chains every 2 feet 9 inches. A man can drag three at a time. This work should be done the last week in April, and then manured as soon as possible. It is generally conceded by all potato growers that well decomposed horse manure, mixed with earth in the compost heap, is the most suitable for their growth. A one-horse load is sufficient for 400 hills, the proper quantity being dropped where the chain marks cross the furrows, and covering it lightly with earth. It is the general practice now wherever the soil will admit of it to make the hills with a plow. This is done by plowing up ridges over the manure as high as possible with a one-horse plow, leaving every 6th or 8th row unplowed, to mark the ridges for setting the sprouts. This work should be done in wet weather. A shingling lath with handles attached can be used for marking the ridges. The sprouts should be removed from the bed, from the middle to the last of May, whenever the weather is warm and the ground moist enough to insure their living. If the ground is not pretty wet, I think it pays to water them, if the water can be obtained without too much labor. Transplanting used to be performed with the hands, which was very hard on the back, but now that labor is principally done with a machine made for the purpose in the shape of a pair of tongs and a paddle, which seems to answer as well as the hands, and the work can be done standing up, which is a great saving to the back. Some prefer using trowels made for the purpose. Cultivation should commence as soon as the sprouts have a good hold, by running the cultivator both ways, following by hand hoeing, to remove the grass that remains around the plants. It is generally necessary to perform this labor twice at proper intervals, by that time if they have made ordinary growth the vines will need turning, which should be done, and the cultivator run one way, care being taken in not going too near the hills. There have been several machines invented for turning vines, but none seem to answer the purpose. In 5 or 6 days after the tilling referred to, they will be ready for their last dressing, which consists in turning the vines across the way they were last cultivated, and scraping the hills lightly with a hoe, to eradicate what grass and weeds may be there, and then plowing shallow towards the hills. This, if done thoroughly, is all the cultivation needed. It used to be considered necessary to hoe them after this, hilling

them up as much as possible, and twisting the vines around the top of the hills; but experience has proven that this work does not add anything to the crop. There is a difference of opinion amongst growers, whether it injures the crop to allow the vines to take root.

Never having experimented in this direction, I am unable to speak from positive knowledge, but am inclined to the opinion that it does not lessen the crop to have the vines to attach themselves to the ground. I rather believe it is an advantage, for three reasons: first, because it seems to be Nature's plan, and she is generally right; secondly, by taking root they form a more even covering over the ground, which tends to prevent the grass from growing, and acts as a mulch, preventing the too sudden evaporation of moisture; thirdly, I believe that when the vines are rooted to the ground they supply a greater amount of nourishment to the potato.

Crop.—Four baskets to the 100 hills is considered a fair crop in an ordinary season, although in some localities the yield has been known to reach eight or ten baskets in a favored season. Of late years growers have seemed anxious to get their potatoes into market as soon as possible, often commencing digging the latter part of July, when the yield is not more than one and a half to two baskets to the 100 hills, believing that number pays better at the prices they bring than a full crop later in the season. As all ground will not raise them equally early, those having the favored kind take advantage of it, and get theirs into market before the bulk of the crop is dug. The light soils lying along the river Delaware south of Camden, and also the same kind of soil lying along the different creeks in the southwestern part of the State emptying into the said river, are well suited to the early growth of this tuber. It seems strange, but true, that the farther we go from water navigation the later the crop. Potato growers living near the markets, or near water navigation, generally market their crop as they dig it. Those living farther from markets and depending upon railroads are in the habit of keeping the bulk of their crop for winter market, having houses built on purpose for their keeping. Two cents per hill, clear of marketing expenses, is considered a paying price. About the first of October growers secure their seed for another year, by selecting those that will measure from one and a half to two

inches through, and the shortest ones they can obtain. These are kept in boxes or barrels in a room kept at a temperature comfortable to live in. Of varieties, three are all that are in general cultivation—those of yellow and red skins of the Nansemond families and the white and pink yams. Of the yellows, the “short Nansemond” is held in the highest estimation, being of a deep golden color, and, when grown on light soils, of excellent quality, sweet and dry. Growers have given to this variety different names in different localities, owing, I suppose, to its growing different shapes and color in different soils. Those of red skins are of about the same quality, but some think they are hardier and more prolific. The yams are the earliest sort grown, but of poor quality. They are not very extensively cultivated. There is no difference between the two kinds. Of the number of bushels grown annually in the State, I have no means at hand of telling.

Of the insects that trouble the sweet potato plants, two kinds of bugs, one called “peddlers,” the other “speckle-backs,” and a small black flea, is the most destructive. The fleas generally attack the sprouts soon after they are transplanted, the worst on stiff land, or damp places, seldom troublesome in warm soils. They are always more destructive in cold and backward springs, often ruining whole patches. They are a formidable enemy to those who undertake to raise sweet potatoes on heavy land. I know of no remedy, except plenty of sunshine and chickens. Bugs are not as formidable an enemy, although they do considerable damage. Their depredations are not confined to cold soils or damp places, but often attack the plants on dry light land. Poultry eat them with avidity, and where they can conveniently be introduced into the “patch,” will generally rid it of the pest.

There are but two diseases that sweet potatoes are subject to in this State, that I am aware of, the black rot and the yellow or ground rot. The first named disease sometimes makes its appearance in the bed. Plants from a bed having this disease will show signs of it by being marked with little black spots beneath the ground. This is mostly caused from the potatoes being diseased when placed in the bed, may possibly be caused by the bed being subject to the extremes of heat and cold or dampness. The roots of plants from such a bed, when transplanted in the field, will mostly rot off near the surface, and often the whole sprout

will die. If the weather is very favorable they will take root at the surface, and sometimes produce a fair crop, but the potatoes will be more or less marked with black patches, and a great many will be unmarketable. This disease seems to act on potatoes like cancers do on human beings. It first appears in the shape of a small black speck, which gradually increases in size until it will sometimes extend all around and through the potatoes, entirely destroying them, and often causing the whole hill to die. I don't know whether this disease can be cured or not, but I believe it can be entirely avoided by using none but healthy seed, and by the proper management of the hot bed. I think this disease is often brought on by transplanting too early. The yellow or ground rot is a more formidable disease, having so far baffled all attempts to cure or prevent, notwithstanding that \$1000 have been offered for a remedy. This disease appears to be in the ground. I have never known it to make its appearance in the hot bed. I have grown healthy potatoes from diseased seed, proving to my mind that the disease is in the field. The first indication of this disease is the leaves turning yellow on the top of the hill, and if the roots of these are examined they will be found very much eaten, and often entirely destroyed. It spreads very rapidly, especially in dry, hot seasons, and when it once shows itself it is hardly worth while to plant that ground in sweet potatoes again. As yet no one has been able to ascertain whether the disease is a rot, or the work of insects. I can not as yet believe it is a rot, for three reasons: First, it is always worse in a hot, dry season. Secondly, potatoes on the highest and the driest ground are the first affected. Thirdly, if the weather comes very favorable to the growth of potatoes after an extremely dry spell, the wounds or scars on the potatoes will heal over, and if the weather continues moist, the disease is arrested. Now if it was a "rot" the contrary, certainly, would be the case, and instead of its being arrested by wet weather it would be increased. The marks of this disease are different from that of the "black rot," being nearly round, the first marks looking as if a small worm had bored into the potato. This, of course, increases in size as the disease progresses, but mostly keeps somewhat in a circular form. The marks of "black rot" are always irregular. The cause of this disease (the "yellow rot") is still wrapped in mystery. In this vicinity farms that were first attacked with it,

were those where potatoes had been grown the longest, and where city manure had been principally used. Still, instances are known where this disease has attacked potatoes on ground comparatively new to their growth. These cases are rare and the disease might have been carried by the winds or by the implements of cultivation. I have yet to learn of a single instance where this disease has made its appearance upon land where home made manure has been exclusively used. It is truly proving a scourge to potato growers in this county. The most reliable land for the growth of this tuber is now so affected with this disease that its cultivation has to be abandoned and new ground sought after. Ground once affected with this disease has never been known to get rid of it. Lime and salt have been tried as remedies, but have proven valueless. Not planting potatoes on the affected land for several years has been tried with no better results.

I think that some of our scientific men should be employed at the expense of the State, to investigate this disease, and if possible prescribe a remedy."

BLIGHT IN SWEET POTATO CROPS.

In reference to this disease, J. G. Whitall, of Woodbury, Gloucester county, writes: "I ship you to-day, per express, two boxes of soil and potatoes. One contains soil and the potatoes grown in it, which were badly affected by the disease, so much so that the owner did not consider them worth digging. This soil formerly produced regularly good crops of sweet potatoes. In moist spots it still yields fair crops. The other box contains soil and potatoes from recently cleared field. It appears to have more vegetable matter in it than our soils which have been cultivated for a long time. This disease attacks the yellow and red varieties indiscriminately. A variety known as the "Bermuda," of very inferior quality, and grown in small lots only, on account of being so much earlier, is not so much affected by the disease. I suppose this may be due to its greater vigor. Potatoes from any locality planted in the *diseased* soil are affected. But I am not sure that the potatoes taken from *diseased* soils and planted in fresh soils will be diseased. The disease, or whatever it is, seems to be confined to certain fields, or even certain portions

of fields, while those immediately adjoining are free from it years, and then become affected. It is gradually spreading over large portions of this and the adjoining counties. And land once affected does not seem ever to become free from it.

“The disease is worse in dry soils than in moist ones, and worse in dry seasons than in wet ones. This season the crop was unprecedentedly large where not diseased.”

The potatoes were received, and when the boxes were opened the diseased lot appeared soft and rotten. The soil accompanying them was a yellow, sandy mass, and contained very little vegetable matter. That with the sound lot was dark colored, and also sandy, but contained much more vegetable matter. A microscopic examination of the potatoes did not detect any differences between those diseased and the sound, healthy ones. An examination of the inorganic residue, or ash, after drying and burning, likewise failed to discover any differences which could account for, or explain this affection. The extent of the malady and the loss in one of our staple crops, calls for further examination. To make such of any value the nature of the soils, their conditions and all the circumstances attending the growth of the crop must be considered, besides further chemical and microscopical examinations.

WM. DOOLITTLE, OCEAN VIEW, CAPE MAY COUNTY,

writes in regard to general farming in Cape May county, as follows:

“The farm methods of this county have undergone a wonderful change in the past few years. When I moved here eleven years ago, a field of clover was almost a novelty, and we were told that it could not be grown on this kind of soil. Now clover fields are as common as wheat fields. Last summer I saw a great many pieces of clover as tall and as rank as could be seen anywhere. And the attention of farmers is being engaged in raising grasses with marked success. Timothy grows well, but will not stay as long in the ground as in grass countries. Experiments are being made with orchard blue grass, and so far results are favorable.

“The use of guanos and phosphates is almost wholly ignored. We think a barn yard of manure is worth more to bring up our

worn out lands than all the patent fertilizers which the West Jersey railroad could bring us in ten years. The secret is that farmers are making manures from the surplus grass, &c., of our meadows in vast quantities, where scarcely any was used a dozen years ago. And our facilities for making manure are unsurpassed.

"If a yard is well littered with sea drift and grasses, one hog will make 20 loads of excellent manure. The same can be said of cattle. And in this we get the start for clover. Corn is one of our staple crops. There were several fields of corn which yielded 50 bushels to the acre, but the past season was favorable and the yield above an average. Wheat also was good, but it takes good ground to make big wheat, and we have not yet reached that point. A little more manure will set it all right. Some yields of 30 bushels, and even as high as 40 bushels to the acre were obtained, but they are rather scarce.

"In farm stock there is a decided improvement, and farmers are looking for a better grade of dairy cows.

"Another sign of a better day dawning, is in the improvement in our roads.

"One great impetus to the farming interests has been brought about by a farmers' club. It has had a wonderful influence.

"In giving you an account of my farming, I shall be under the necessity of estimating expenses as no debit and credit account has been kept.

"My farm consists of about 50 acres of plowed land, 30 acres of salt meadow and pasture, and the remainder of woodland.

"The soil generally is a sandy loam, with clay deposits near the salt marshes. Corn, wheat, potatoes (both kinds), with a general variety of truck to suit our markets, are raised.

"The farming is mostly carried on with one horse. Our breaking up requires two, so we call it a two-horse farm. We keep 5 cows, 2 hogs, 40 hens, and a few turkeys.

"The only fertilizers used are made on the farm, excepting about 200 bushels of lime and 4 tons of marl. We use probably 150 to 200 loads of manure.

The expenses for lime, marl and labor (mostly performed by myself and son-in-law), are estimated at.....		\$400 00
Corn, 250 bush., @ 60 cts.....		\$150 00
Wheat, 31 bush., @ \$1.40.....		43 40
Sweet potatoes, 80 bbls. primes.....		125 00
Sweet potatoes, 50 bbls. culls.....		45 00
Butter, 325 lbs., @ 35 cts.....		113 75
Poultry and eggs.....		45 00
Calf.		8 64
Strawberries.....		55 00
Pork, 500 lbs., @ 8 cts.....		40 00
Truck of various kinds.....		100 00
Total sales.....		\$725 79

“The net profits above what was used in the family would be about \$100. We have said nothing about corn fodder, which is quite an item, but it is added principally to the manure heap.

“We are experimenting some with marl. So far it has proved first rate for potatoes. It is too expensive to use for grass.

“*Sweet Potato Growing.*—We make, a few weeks previous to planting, a compost of stable or barn-yard manure, and an occasional load of salt mud or muck, and any other material on hand, pitching it over once or twice to have it thoroughly mixed. The hills can be made some time before planting. The ground is plowed shallow, furrowed out three feet apart, worked crosswise the same distance, so that they can be cultivated both ways. The manure is put in the furrow, about a good-sized shovelful to three hills, covered with a hoe or plow, raising the hill above the surface in a conical form. The potatoes are put in a hot bed, covered with glass, about the 1st of April, so that the sprouts will be large enough to commence setting by the 10th of May, if the weather permit. Early potatoes find the best markets; and sandy soils give the best quality.

“A good yield will give a barrel of primes to a hundred hills. The small potatoes, not fit for market, are fed to hogs and cattle. They cannot be surpassed for making pork, both as to quantity and quality. The small potatoes, as feed on the farm, will pay for raising the whole crop. This makes them a cheaper feed than corn. In this latitude we generally commence about the 1st of September, and we have nearly three months to feed.

They should be used before it is too cold. The quality of the Cape May potatoes is equal to that of the Delaware."

ON THE GROWTH OF SWINE.

From the Mount Holly Herald, Feb. 16, 1878:

"*Burlington County Swine.*—The township of New Hanover has long been noted for its crops of immense hogs, and this year is no exception. Exactly why such prodigious porkers should be raised in that particular locality is not known, but it is so. About equidistant from Recklesstown, Jacobstown and Arneytown are three farms, on which have been raised this year three crops of hogs that cannot be excelled in this country. The land in the neighborhood is high and rolling. There are mounts and hills from which a commanding view of the adjacent country can be had, and the farms are owned by men whose names have long been synonymous with good farming, such as Lawrie, the Stewards, Canfield, Howard, the Bullocks, Harrison and others. The farms, as a rule, are very large. Anthony Bullock is the owner of five farms in the vicinity, which aggregate nearly 1,000 acres; Miller Howard has five farms which foot up 700 acres; Peter Bruere has 750 acres; John P. Hutchinson has 550; Gilbert Lawrie, Israel J. Woodward, Isaac and Charles Steward have each about 500; Isaac Harrison owns about 550 acres.

"The first place visited was the farm of Isaac Harrison, occupied by his son Richard, and called Harrison manor. It contains about 400 acres of the very best of land, and is known as the beginning of Cream Ridge, if the famous Ridge has any starting place, about which many interested parties have thrown a doubt. Isaac Harrison was known for years as a successful pork raiser. Some years ago he removed to Philadelphia, and gave up his farm to his son, who seems to be even more successful. Some years ago Mr. Harrison raised from 1,600 to 1,800 bushels of wheat in one season on this farm, for which he received about \$4,000. He also fattens quite a number of cattle. But it is of his pork crop that we wish to speak. He started to fatten 32, but some were slaughtered because of their breaking down or for other reasons, until they numbered on the day of slaughter but 21. Among those that broke down was the Centennial prize hog, which Mr. Harrison purchased. Some one im-

prudently got in his pen and injured him or caused the hog to injure himself. Saturday last was the day of slaughter, and the crowd that gathered was uncomfortably large. When dressed, the hogs weighed somewhat more than when delivered, shrinking about six pounds each. The weights as sent us by Nathan Folwell, Bordentown, to whom they were sold, were as follows: 727, 710, 702, 695, 690, 672, 666, 665, 664, 662, 659, 656, 650, 649, 642, 637, 631, 611, 610, 599, 564. Total, 13,671 lbs.; average, 655 lbs. Last year Mr. Harrison's crop was 28 hogs, that averaged a trifle over 619 lbs., the heaviest weighing 749 pounds. This year Mr. Harrison killed 34 pigs, the heaviest weighing 366 and the lightest 182 lbs.; average, 229 lbs.; total weight, 7,791 lbs. Last year, 35 pigs weighed 8,279 lbs., and averaged $236\frac{1}{2}$ lbs. The price received by Mr. Harrison is not publicly stated, but is supposed to be about $5\frac{1}{2}$ c.; last year it was 8c. He has several shoats left over to select his mammoth fellows from for next year.

"The farm adjoining (formerly George Bullock's), is also owned by Isaac Harrison and is leased by Samuel L. Southard, who is noted for his success in fattening hogs. We found him in the pen looking carefully after the comfort and appetites of his pets, 18 of them old hogs and 22 pigs. He intends to kill next week. The hogs will average over 700 pounds and are magnificent specimens. They do not travel about much and seem to have great trouble in getting air. Last year, Mr. Southard's crop of pork consisted of 14 hogs that averaged 570 pounds and 15 pigs that averaged 287 pounds.

"The next farm visited was the homestead farm of William W. Bullock, deceased, now owned by his son, Anthony Bullock, and leased to Joseph Carter. Mr. Carter carried off the ribbon last year for fat hogs and this year will see him at the top again. This farm contains 210 acres of most excellent land. The buildings are in excellent repair and very convenient. Besides fine hogs, Mr. Carter has some superior lambs of Southdown blood, raised from 106 ewes, some choice capons, fine colts, horses and cows and extra sweet potatoes. Some white oats raised on the farm will weigh 34 pounds to the bushel and his growing wheat is very promising. Mr. Carter is looked upon as a model farmer. He intends to slaughter his crop of hogs the latter part of this month. He has 23 hogs that will average over 700 pounds, some of which will be thrown out, which will bring up the average considerably. All of his hogs except one were able to get up.

They took their feed greedily and seemed to be taking on flesh. One or two of his hogs will weigh over 900 pounds. Last year one weighed 905 pounds. He then slaughtered 20 that averaged $681\frac{1}{4}$ pounds. He started to fatten about two weeks later than his neighbors, Southard and Harrison, but he seems to have got ahead of them. He has reduced the number from 27 to 23, by reason of their breaking down, &c. He has also 21 pigs that will pull down the scales at a big figure. Mr. Carter hasn't bought any corn but has three large cribs full left over. He raised last year about 3,000 bushels and some wonderful stories about the size of stalks are told. He has 30 shoats left over, from which to select for next year's fattening.

[The following figures have been received from Mr. Harrison:

Killed February 20th.	Killed February 25th.	Killed February 9th.
SOUTHARD'S 18 HOGS.	CARTER'S 18 HOGS.	R. HARRISON'S 21 HOGS.
785	892	727
782	842	710
780	755	702
764	733	695
741	730	690
732	728	672
706	705	666
705	696	665
703	693	664
693	683	662
692	680	659
689	674	656
664	662	650
651	658	649
642	648	642
634	642	637
632	639	631
624	629	611
		610
12,619	12,689	599
	*144	564
	12,545	13,761
Average 701 pounds.	Average 697 pounds.	Average 655 pounds.

*Deducted for error in weight—SEC'Y].

“The choicest lot of pigs was that of Samuel Potts, who lives on another of Mr. Bullock’s farms at Georgetown. It contains one hundred and sixty-four acres. These pigs are remarkably fine, and number forty-three. None in the State can surpass them. They will be slaughtered this Saturday, and will average three hundred and seventy-five pounds; they were born from April 15th to May 15th. He has also fifteen heavy hogs that will average nearly six hundred pounds. A nice herd of cows brings him in quite a revenue.

“Mr. Bullock estimates that his tenants will raise this year about one hundred and six thousand pounds of pork, in which are included the crops as above stated, and those of Wesley Clark, near Pointville, about fourteen thousand pounds, Mr. Stille’s, opposite Joseph Carter’s, about seventeen thousand pounds, averaging four hundred and eighty-six pounds, Barclay Carter’s, adjoining the residence of Mr. Bullock at Recklesstown, about nine thousand pounds, made up of thirteen old hogs that averaged four hundred and twenty-one pounds and thirty-eight pigs, and the crops of Letts and Charles E. Wallace, at Peppler’s mill, both killed early, which ran up to several thousand pounds.

“The crop of Peter Bruere this year consisted of twenty-seven hogs that averaged five hundred and three pounds; two years ago he slaughtered twenty-eight that weighed five hundred and eighty pounds. On one of Miller Howard’s farms some years ago, Thomas Hood, the then tenant, slaughtered forty hogs that averaged five hundred pounds.

“But our readers will want to know more about these mammoth hogs—their breed, their age and how they are fed. They are of no distinct breed. They are not Magie, nor Essex, nor Berkshire, nor Yorkshire, nor Chester White. They are pure Jersey Red and that is giving them considerable latitude, for it includes almost everything. They may be classed as indigenous, native born, a stock that the neighborhood has known for years and years. All the old hogs are about 21 months old, pigged in the April or May of the year before, some as late as June. The pigs are just a year younger, or about nine months old. The shoats for fattening are selected expressly for the purpose, and a good breeder knows the points. Only a little more than ordinary care is taken with them, until they are brought up to fatten. The pigs are fed on slop and milk, mixed with a little ground

rye and corn meal. In summer, all run on clover, which fattens them but not with solid fat. They are put in the pens at husking time and then the care begins. At first, whole corn is fed them, then they are given corn meal mixed to a mush with hot milk. They are not crammed but are fed systematically. As the fat begins to increase, the hogs gradually lose their sight and hearing. The fat covers them and shuts out both. As they begin to carry around about 700 pounds of pork, they are given greater attention. Often the owner gets out of bed two or three times during the night to see if all is well. They are liable to break down under the accumulated fat, that is—break one of their legs or get lame. Then there is a danger that they may suffocate. To remedy this, blocks must be placed under their heads to give them a chance for free air. They always sleep or rest with their heads elevated, and a pen of 20 heavy porkers gives forth sounds by no means melodious or pleasant. Sometimes a hog will “go back,” refuse to eat and lose heavily in a few days. Then he has to be humored and fed by hand with balls of mush. It is a science, requiring great patience and labor. Some say it does not pay to fatten hogs to such heavy weights, but those who practice it, say it does, and that they make money by it. Large quantities of manure are made by these hogs which keeps up the fertility of the soil, and then an extra price is paid for them, for like everything else, they have a special use. Being masses of fat they are sought after by the owners and masters of whaling vessels and other craft that voyage in cold countries, and the pork is also shipped for consumption by the inhabitants thereof. The fatty pork gives great nourishment to the men who are exposed to the cold temperature. On these accounts, those who fat heavy pork, say it pays.

“The crowds that visit these farms are numerous, too much so, frequently, but therein consists considerable of the satisfaction realized by the owners, who certainly deserve something besides pecuniary profit for their trouble. It will pay anyone to take a look at these mammoth, sleek-looking creatures and wonder at their greatness.

“Joseph S. Gaskill, on the farm of M. S. Pancoast, near Columbus, has killed this year 20 April pigs that weighed 5,264 pounds. The heaviest weighed 314 pounds and the lightest 209 pounds,

an average of 263 1-5 pounds. He received five cents per pound for them from a Trenton butcher.

"James L. Smith near Jobstown, killed on Monday, 11 spring pigs that weighed 4,356 pounds, an average of 396 pounds.

"Mahlon Prickett of Shamong has killed 25 pigs that averaged 301½ pounds.

"The following is the weight of the pork crop killed a few weeks ago by Zaccheus A. Harris of Cookstown: 24 hogs, the heaviest weighing 540 pounds and the lightest 382 pounds, total weight 10,624 pounds, average 442⅔ pounds; 23 pigs, the heaviest weighing 213 pounds and the lightest 170 pounds, total weight 3,590 pounds, average 156 2-3 pounds.

"Joseph H. Lippincott, near Vincentown, killed on Wednesday, his pork crop consisting of 8 old hogs that weighed 4,336 pounds, an average of 542 pounds, and 11 May pigs that weighed 3,093 pounds, an average of 281 2-11 pounds."

Extracts from the Monmouth Democrat:

"*Monmouth County Swine*.—On the 11th of December last, Mr. Edgar Kirby, of Ellisdale, delivered to Charles Nelson, at Im-laystown railroad station, forty-two pigs, whose total weight was 6,300 pounds, an average of 150 pounds each. On the 31st ult., the same gentleman delivered to Nathan Folwell, at Bordentown, 15 old hogs that weighed respectively 459, 547, 557, 452, 581, 457, 540, 574, 559, 552, 480, 700, 548, 520 and 780—total 8,300 pounds; average weight, 554 pounds. The above crop of pork was fattened on a farm of 100 acres in Upper Freehold, in one season.

"Collin B. Meirs, Esq., of Cream Ridge, in this county, raised and fattened on his own premises last year, 26,540 pounds of pork, dressed weight."

J. L. RUE, OF UPPER FREEHOLD,

Sends the following notes:

"Richard T. Ridgway, Upper Freehold, fattened 33 hogs, which averaged 479½ pounds. Another neighbor, Henry P. Davis, fattened 34 hogs, average 440 pounds. John R. Longstreet, 30 hogs, average 440 pounds.

"George Wildes sold about 40,000 pounds of pork raised on two farms.

DAIRY FARMING.

DANIEL BAILEY, GLENWOOD, SUSSEX COUNTY.

Writes, "I send herewith a condensed statement of the product of one farm for the year ending March 31st, 1878. It was carried on entirely by hired labor and with but little supervision from myself, as I could not spare time from other business to look after it.

"The farm is located in Vernon township, Sussex county; contains 150 acres; soil, loam with a clay subsoil. And it is carried on as a dairy farm. About one-tenth of the land is kept under the plow and the system of rotation of crops followed. Each year the oldest field, that is, the one that has lain longest in sod, is broken up from eight to ten inches in depth, a crop of corn planted, followed by oats and then re-seeded with clover and timothy. About one-quarter of an acre of beets was put in 1876 and proved such a valuable addition to the winter feed that a much larger surface was planted in 1877. And we propose to sow more yet the coming season—variety, Lane's improved. After the last plowing, common field turnips are sowed broadcast in the cornfield. If the season is favorable, that is, wet enough, a large crop of these can be looked for. These are usually fed to the dairy early in the winter.

"We keep for stock thirty cows, one yoke of oxen and one team of horses. The cows are of mixed breeds—Alderney, Ayrshire, Devon and native. Nearly all are raised on the farm, our practice being to keep the best calves of our own and to get the best calves from surrounding farms.

"The cows are changed from one pasture to another frequently in summer. In winter and from about November 1st to May 10th, they are stabled at night, and, in severe weather, during the day also. About one-fifth of the dairy are winter milkers. These are fed once a day on wheat bran and corn meal, mixed and scalded, the quantity depending on the condition of the cattle and the demand for milk. The winter milkers are given the best hay also, the dry cows having to put up with straw and coarse hay for the first half of the winter. All are fed corn-stalks once a day, the beets are cut and fed in small quantities as long

as they last. Toward spring all are fed light before coming in, and full afterward, until grass, which with us is about May 10th.

"The only fertilizers used are barnyard manure, of which we try to make as much as possible, and plaster sowed on the young clover. The manure is applied where it is needed the most. And we never have enough of it.

"Two men are employed the year round, with additional help during planting and haying.

"You will see by the above that our farming is entirely old-fashioned. The average corn crop is about 80 bushels of ears to the acre; of oats, about 40 bushels. Nearly all the grain raised is fed on the place and about ten tons of wheat bran purchased from the west. The result of the year's farming follows:

Sold April.....	6,666	quarts of milk @ 3 12-100 cents per quart.....	\$207 98
Sold May	10,230	" " @ 2 37-100 "	242 45
Sold June.....	10,445	" " @ 2 20-100 "	229 79
Sold July	8,199	" " @ 2 3-11 "	186 34
Sold August	8,121	" " @ 2 4-10 "	194 90
Sold September	5,984	" " @ 2 87-100 "	171 74
Sold October	4,851	" " @ 3 1-5 "	155 23
Sold November	2,632	" " @ 3 1-5 "	84 22
Sold December ... {	2,611	" " @ 5 " }	141 77
	187	" " @ 6 " }	
Sold January..... {	2,050	" " @ 4 " }	86 45
	89	" " @ 5 " }	
Sold February	1,659	" " @ 3½ "	58 07
Sold March	2,304	" " @ 3½ "	80 64

Total.....	66,028	quarts.....	\$1,839 58
Calves sold.....			29 26
Grain and produce sold.....			251 34

\$2,120 18

Labor.....	\$740 00
Feed	242 52
Repairs to farming utensils.....	75 00
Expense items.....	125 40
Plaster, 4 tons.....	32 00
	<hr/> \$1,214 92

Balance	\$905 26
Interest on value of farm, \$12,000; stock and farming utensils, \$3,000.....	1,050 00

Loss	\$144 74
------------	----------

"The milk was sold to a creamery near by for the first eight months, at the market price of butter, rating twelve and a half quarts as a pound, and for the remaining four months, at a fixed price. We experienced a severe drought during the latter part of the season—in September and October—otherwise the result might have been more favorable.

OSCAR DUNN, DECKERTOWN P. O., SUSSEX COUNTY,

Writes, "I have five farms, four of which are worked by tenants. These four farms kept 100 cows in 1876. Altogether I have about 700 acres of land, of which 170 acres is timber land. The four farms occupied by tenants, sent to New York in 1876, \$8,483.32 worth of milk; calves brought about \$150, and sold 2,000 pounds of pork. I have now altogether, 137 cows; do not milk much on my home farm. The cows which do not suit my tenants, I take home and turn these into beef, which is cleared off the fore part of the summer. Any time in September I begin to buy my cows. I buy none unless they suit me as good milkers. No other stock is kept on my farms, excepting a team of horses on each. I have had the Ayrshires and Short Horns, which latter are my preference. I feed everything in the shape of feed—a great deal of wheat bran; and it is much better to scald it. Of the 100 cows milked, 20 of them drop their calves in the fall. We feed these nothing but corn fodder in the summer. I winter about 35 cows on the farm where I live. These are for beef, and about 20 of them fresh, which I sell in the spring.

"The amount stated above is clear, after paying five per cent. for collecting. I am now selling my milk myself; there have been times when I sold a great deal more.

"As regards raising grain, I grow but two crops. I formerly raised corn, and after it, in the fall, sowed with wheat. I now plow my corn stubble in the fall, top-dress in the winter, and sow with oats in the spring; then seed down with clover and timothy.

"In the early days of our Sussex County Fair, I raised 187½ bushels of wheat on 4¼ acres of ground. The land was measured, and I received the premium for the crop."

JACOB B. LEPORT, DECKERTOWN, SUSSEX COUNTY.

"My farm is three miles from Deckertown. It contains 175 acres, of which 25 are woodland. It is quite hilly. It produces grass, hay and grain sufficient for keeping the stock, and a considerable surplus of grain, which is sold.

"I do my own work, and all the labor connected with the manufacture of the milk into butter. My cellar is away from the house, and is built expressly for the dairy needs. For the past three years the number of cows kept, the butter product and the returns have been as follows :

1874—kept 24 cows, 4,025 pounds of butter.....	\$1,514 80
1875—kept 18 cows, 2,915 pounds of butter.....	966 28
1876—kept 16 cows, 2,310 pounds of butter.....	747 86

"In the above the butter consumed by the family (four persons usually, including two hired men.) is not included, as I have no means of ascertaining the milk and butter used at home. There is one other item of revenue connected with the butter making of a dairy, and that is the raising of pigs on the milk after the removal of the butter. In 1876 I raised and slaughtered 31 pigs, and their aggregate weight was 5,915 pounds. From this I realized \$458.39 ; and this sum is nearly the average for the other two years.

"Veal calves is another item. This usually amounts to \$50, got by making early veals before the season for butter-making begins, which is about the first of April.

"The general practice of dairy farming in the northern part of Sussex county, is to make the most and freshest grasses for pasture in summer, and the sweetest and best hay for the winter fodder. To accomplish this, the low parts of the farm are drained and put in meadow, the bogs and foul grasses being kept out as much as possible. These meadows are kept in good condition by top dressings of stable manure. Few farms have enough such meadow land to meet their wants. And more or less upland is also kept for pasture. For the renewing upland the least productive grass land is, from time to time, plowed up, manured well and planted with corn or other grain, needed for the stock and other home uses. In the spring following it is again plowed and

sowed with oats. After the oat harvest it is put in wheat and seeded with clover and timothy. The next season this is the mowing ground. It is kept in grass until it again becomes poor and yields light crops of hay or poor pasturage, when it is again plowed up and carried through the same rotation of corn, oats and winter grain and then seeded down. This system is slightly varied by some farmers. Some are using corn fodder to help out their pasturage, and some of the dairies are using roots, mostly turnips. But the main point is to manage the farm so as to get the largest amount of grass. The following products of a small farm near Deckertown, give a fair exhibit of a good dairy. It contains about 130 acres of pasture and tillable land, and is not considered as in a high state of cultivation. Last season (1877) 11 cows and 3 heifers were kept, making what dairymen call 13 cows. These made from February to the middle of December (or for the season), 2,379 pounds of butter, exclusive of the amount consumed by the family—an average of 183 pounds per cow. The pigs raised on the buttermilk, and properly a product of the dairy, sold for \$118.65, and the calves brought \$47.50. The cows of this herd were not blooded, but mostly of native stock. This is not an extraordinary account, as there are dairies where a single cow produces 200 pounds of butter in a season. So large a product requires favorable circumstances, including seasons, &c. Many do not get 120 pounds per cow, and consequently the average is not equal to the dairy whose account is here given. And it is said that the difference is not so much in the quantity of milk obtained as in the amount of butter, indicating a lack of skill in the handling and making.”

DAIRYING IN UNION COUNTY

As presented at a meeting of the Union County Farmers' Club, Elizabeth. President Noah W. Parcell in the chair, and Mr. Dennis C. Crane, secretary.

An interesting paper, prepared by Mr. T. B. Miner, of Linden, on the Production of Milk and Butter, Best Breed of Cows, Food, etc., was read, and called forth an interesting discussion on the subject. Mr. Miner favored grade cows for butter—a cross between the Jersey or Alderney and good common cows—and Ayrshire or Short Horns, instead of Alderney, if milk alone is

wanted. He advocated growing sowed rye, corn, millet and clover as feed in summer, with pasture, and in winter, clover, stalks and roots, such as mangolds or beets and turnips.

A statement of the product of milk from five cows, from January 1, 1877, to January 1, 1878, by N. W. Parcell :

	Quarts.
Measured and sold	11,320
Used in family (estimated).....	730
Fed to calf raised (100 days from February 1).....	300
	<hr/>
Total.....	12,350
The average quantity per cow per day is 6 4-5 quarts very nearly.	
The average price per quart for the milk, 4 $\frac{1}{2}$ cents.	
The amount in dollars and cents, valuing the milk used in family and fed to calf at the same price as that which was sold, amounted to.....	\$535 16
Five calves sold at an average of eight dollars a piece.....	40 00
	<hr/>
	575 16
During the year I exchanged cows twice, which cost me \$77, that should be deducted from the amount of milk sold. The reason why is, I got fresh cows for those that had been milked out. Deduct.....	
	<hr/>
The balance for five cows is.....	\$498 16
	<hr/>
The average per cow is in dollars and cents.....	\$99 63
The estimated cost of keeping a cow a year is five tons of hay at \$12 per ton.....	\$60 00
From four to six quarts of corn meal and wheat bran in equal proportions by measure, two hundred and seventy days, at an average cost of eight cents per day.....	21 60
(I estimate eight cents per day, because some I fed six quarts and others not more than three quarts, owing to the condition they were in.)	
One-half bushel of turnips per day, one hundred and twenty days, at five cents per day	6 00
Interest on \$60, the value of cow.....	4 20
	<hr/>
	91 80
	<hr/>
Balance per cow for the year.....	\$7 83

In the statement I have not charged any thing for taking care of and milking the cow, neither have I given credit for the manure that has been made. I think the labor of taking care of and milking is worth more than the manure when it can be bought for \$1.50 per two-horse load. I have counted five tons of hay per cow a year. My reasons are, that with my mode of feed-

ing it will take that amount of good hay to keep a cow a year, and my pasture lands will produce as much as my meadow land if it were not pastured. Still they run to pasture in summer.

The only profit (if any) in keeping cows to sell milk from with last year's prices, is in feeding them with sowed corn, pumpkins, refuse cabbage and turnips in the summer and fall, and corn-stalks in winter, which cannot be sold to advantage off the farm.

I will also state that I believe that my milk is richer in cream with my mode of feeding than it is when cows are fed on beer grains and have less hay and meal, and that the quantity of my milk is less.

Mr. Lewis H. Wade, of Union, a large milk raiser, also questioned whether he had made anything the past year. Low prices which he got for milk, and bad debts with milkmen, had almost discouraged him from continuing in the business.

Mr. E. P. Beebe thought the farmers who raise milk around Elizabeth ought to form themselves into an association, and run out the thirty or forty petty peddlers who drive from six to eleven o'clock in the morning, to dispose of fifty to seventy-five quarts. It is not profitable to them, and is an injury to both the producer and consumer. He advocated the system adopted in Syracuse, where an association of farmers own their own teams, raise their own milk, and dispose of it, so that there is very little loss of labor or milk. The city is districted off, each man takes a street or streets and serves every house, and the milk that is left over is taken to the creamery and made into butter or cheese. He thought it was for the interest of the farmers of the club to have such an association.

A statement of milk from ten cows, from January 1, 1877, to January 1, 1878, by John Crane:

	Quarts.
Measured and sold.....	22,816
Used in family.....	1,095
Fed two calves.....	600
Total.....	24,511

The average quantity per cow, per day, was 7 quarts, very nearly.

The average price per quart for the milk was $4\frac{1}{2}$ cents.

The amount in dollars and cents was, valuing the milk used in family and

fed to calves at the same price as that sold.....\$1102 99

Ten calves sold at an average of eight dollars apiece..... 80 00

\$1182 99

The average per cow is in dollars and cents	118 29
The estimate cost of keeping the ten cows a year is 15 tons of hay at \$14 per ton	210 00
Five tons of corn stalks at 7 dollars per ton.....	35 00
2,600 bushels of grains at 11 cents a bushel.....	286 00
One ton of corn meal at.....	27 00
125 bushels of apples, 15 cents per bushel	18 75
Two acres of corn fodder.....	125 00
Pasture two dollars a month for six months 12 dollars per cow	120 00
One acre of cabbage.....	75 00
Interest on \$600, the value of ten cows.....	42 00
	<hr/>
	\$938 75
Balance per cow per year	24 42

STATEMENT OF JONATHAN TOWNLEY, UNION.

Number of cows kept 5, from January 1st, 1877, to January 1st, 1878.

Amount of milk sold 14,163 quarts at $4\frac{1}{3}$ cents (average).....	\$613 73
Used in house.....	912
Fed to calves.....	700
	<hr/>
1612 quarts at same price.....	69 85
	<hr/>
	\$683 58

Daily average per cow nearly 8 3-5 quarts.

Cost—

1200 bundles corn stalks, 3 cents.....	\$36 00
6 tons hay, \$14.00	84 00
6 acres pasture, \$12.00 per acre.....	72 00
530 bushels beer grains, 10 cents.....	\$53 00
cost of hauling	24 00
	<hr/>
	77 00
250 bushels turnips, 15 cents.....	37 50
$\frac{1}{2}$ acre sowed corn	30 00
2000 cabbages, \$2.00 per hundred	40 00
$\frac{3}{4}$ ton meal.....	18 00
75 bushels apples.....	7 50
Interest on \$250 at 6 per cent.....	15 00
Labor.....	100 00
	<hr/>
	\$517 00

Balance \$166.58, or \$33.31 per cow.

STATEMENT OF THE DAIRY OF E. C. NICHOLS, LYONS FARMS, FOR
THE YEAR 1877.

Milked on an average six cows. Five of these are common grade stock, from 5 to 9 years old; one is half Alderney and half Durham, and is 7 years old. She has milked 22 quarts a day; the others ranged, when fresh, from 12 to 18 quarts. The milk per month, and sales, were as follows:

January	1,241	quarts@5 cents.....	\$62 05
February.....	1,153	" 5 "	57 65
March	1,108	" 5 "	55 40
April.....	{ 283	" 5 "	14 15
	{ 658	" 4 "	26 32
May	1,579	" 4 "	63 16
June.....	1,629	" 4 "	65 16
July	1,660	" 4 "	66 40
August.....	1,593	" 4 "	63 72
September	1,628	" 4 "	65 12
October.....	1,453	" 4 "	58 12
November	1,197	" 4 "	47 88
December.....	1,473	" 4½ "	66 29
			<hr/>
			\$711 42

The average cost of feeding, during the first three and the last three months, was about \$45 per month, and for the rest of the year about \$38 a month.

Total cost of feed.....	\$498 00
<hr/>	
Balance	\$213 42
Average income per cow, deducting cost of feed.....	\$35 57
Average milk of each cow a day, 7½ quarts.	

STATEMENT OF J. C. BAKER'S DAIRY.

Milk from nine cows from January 1, 1877, to January 1, 1878,
22,192 quarts.

Amount received for milk.....	\$1,055 73
Deduct for feed, hay, pasture, &c	475 00
<hr/>	
\$580 73	

AN ORANGE COUNTY, N. Y., DAIRY.

The following statement of the product of a good dairy appeared in the Orange County Press, last year. It was so remarkable, and the qualities of the Dutch or Holstein cows, so much an object of interest that the secretary of the board went to see the establishment, and he is happy to endorse the statement published, which is as follows:

“A correspondent of the Press paid a visit to the farm of Mr. W. E. Arnout, in the town of Wawayanda, in January last, in pursuit of knowledge pertaining to the production of milk. Mr. Arnout cheerfully furnished every means at his disposal by which the desired information could be obtained, and although not intended then for publication, we have since thought the facts elicited might interest the readers of the Press and we send them to you.

“On the first day of January the stock on his farm consisted of twenty-seven full-blooded Holstein cows and calves, five Holstein bulls, seven full-blood Alderney (or Jersey) cows and calves, two full-blooded Alderney bulls, (one of them being the quite celebrated imported animal, Waterpower) and seventeen grade cows.

“During the year ending January 1st, 1877, he marketed the milk from thirty-six cows, seven of which were but two years old and of course not yielding largely. The following figures were copied from his books showing the amount in quarts shipped in each month of the year 1876:

January.....	7,970	quarts @	4	cents.....	\$318	80
February.....	10,220	“	4	“	408	80
March.....	11,720	“	4	“	468	80
April.....	11,050	“	3½	and 3 cents.....	361	45
May	12,370	“	3	and 2½ “	339	00
June.....	12,460	“	2½	and 3 “	342	05
July.....	11,250	“	3	“	337	50
August	11,150	“	3	“	364	50
September	9,370	“	3	“	280	10
October.....	9,760	“	3½	and 4 “	366	60
November.....	9,400	“	4	“	376	00
December	10,620	“	4	“	424	80
<hr/>					<hr/>	
Total.....	127,340	quarts.....			\$4,388	40

“To this must be added 7,000 quarts fed to calves and used in the family which makes the total production 134,340 quarts, an average of 3,732 quarts per cow per annum.

“Mr. Arnout first began to materially improve his dairy stock in 1869 and the constantly increasing production shows the wisdom of his course. In 1870, from a dairy of about the same size the production was 81,420 quarts. In 1873 it had grown to 102,530, and in 1875 to 123,110, and as the figures above show, a further gain in 1876 of 4,230 quarts.”

A letter recently received from Mr. Arnout, gives the returns of his dairy for 1877, and a fuller account than that above, of his management and observations as to breeds, &c.

He says: “I will try and give you the results of our observations.

“First.—Get a good cow (I am no stickler as to the breed—only be sure of a good cow).

“Second.—Feed the cow more than is required for the natural wear and tear of the system—enough, so that she may produce something of more value than the feed consumed, and leave a margin for profit. I cannot lay down any fixed rule for feeding, but I feed all that a cow’s system will bear, without waste or overtaxing it. Some will take more than others, and make larger returns from it. Work them up to their full capacity for profit.

“I have tried several breeds, in a small way, but for milk have found none to beat the belt cattle (Holstein).

“I do not say that there are none which will beat them, but that the *belt cattle*, with an equal chance, will make a fair show.

“For a number of years I tried the plan of buying cows. I have come to the conclusion that in order to get good cows, it is better to raise them on the farm, then the chances of abortion and other difficulties are lessened. And while I am raising the cows I am not running the risk of losing that much of productive labor by the uncertainty of getting my milk money, a large item with us Orange county farmers.

“Our feed is good hay, bran, corn meal, oats, buckwheat and barley, either all or only two of them at a time—usually corn meal and bran.

“We raised last year 626 bushels of oats, 105 bushels of wheat and 41 bushels of rye. These are fed without making any

account of them. Last year's sale of cattle was the result of the increase of our herd through several years; and it should be so credited. We shall have to sell several this year to keep our herd down to the capacity of the farm.

“ We had the past year 36 head in milk, but by selling off the old cows and letting two-year old heifers take their places, we have milked during a part of the year 11 two-year olds. The following abstract gives the sales of milk for the year 1877 :

Abstract from Account of 1877.

January.....	10,240	quarts @	3½ and 4	cents.....	\$385 40
February	8,520	“	3½	“	298 20
March	9,720	“	3½ and 3	“	316 60
April.....	9,160	“	3	“	274 80
May.....	12,240	“	2½	“	306 00
June	12,840	“	2½	“	321 00
July.....	9,440	“	2½	“	236 00
August	8,600	“	2½	“	215 00
September.....	7,400	“	3	“	222 00
October.....	7,920	“	4	“	316 80
November.....	8,360	“	4	“	334 40
December.....	9,320	“	4	“	372 80
<hr/>					
Total.....	113,760	quarts.....			\$3,599 00
Cattle, calves and farm produce (sales).....					1,397 00
<hr/>					
Total sales.....					\$4,996 00

If I can furnish any items of interest they will be most cheerfully given, as the results I have obtained have come from close attention to our own business and from the observation of, and comparison with, the results of different modes of management as practiced by our neighbors.

PEACH GROWING IN HUNTERDON COUNTY.

THOMAS C. HAWARD, FLEMINGTON,

writes: “ In this section of country the best soils for growing peaches are a mixture of clay and sand with a porous subsoil, although many are growing them on this kind of soil with a tight clay subsoil, and say they do well. There seems to be a difference of opinion as regards the exposure, some think they do best with

a northern, and others with a southern exposure. A good deal of the land used here for peaches is hilly and some very stony.

“The trees are planted generally 16x16 feet, some 18x18, but the best growers think 16x16 is best, and keep the tops cut in so as not to crowd.

“For preparing the land, the cost and setting out the trees will run from \$10 to \$15 per acre; about 150 to 160 trees to an acre.

“The mode of cultivation is by plowing and harrowing the ground twice in a season, digging around the trees, and thinning out the tops carefully, *all very important*.

“The kind of manures used is lime first, about 30 bushels to the acre, less rather than more. If anything else is used, it is bone dust.

“The trees come into bearing in 3 to 4 years from planting out. The trees are one year from the bud when planted.

“Duration of bearing from 5 to 7 years from commencement. This will vary from several causes, such as variety of soil, exposure, &c., some orchards bearing for 10 years, some not giving more than 3 or 4 good crops.

“In regard to average crop from a tree, or an acre, and the value, it is almost impossible to give an answer, as it varies so much. Some of our large growers say that an orchard giving two baskets to a tree would be a fair crop; and as to value per basket, 50 cents *net*, after all expenses paid, would be a fair average.

“As to improvement in quantity or quality of fruit by extra manuring or cultivation, the general opinion is against it, further than the use of lime, bone-dust, and good care, as before stated. Some think barn-yard manure good, but our best growers dissent. Trees may be stimulated for a time, but more in growth of wood than improved fruit, but is sure to be followed by premature decay.

“The average value of the peach crop of Hunterdon county for an ordinary year is supposed to amount to at least \$300,000 net to the producers.”

CULTIVATION OF APPLES.

STACY P. CONOVER, OF MARLBOROUGH, MONMOUTH COUNTY,

writes: "In reply to yours of the 11th inst., respecting the cultivation of apples, my observation and experience in growing this fruit is much the same as with other crops. Regular tillage, with marl and manure as fertilizers used broadcast, and occasionally shell lime, will keep the trees in healthy condition, thinning out yearly the dead wood and suckers.

"The location of my bearing orchard (which is about 45 years old) is moderately high ground and slightly rolling, with a naturally good clay loam, with very little underdraining. This orchard (17 acres) averaged, clear of freight and commission, about \$200 to the acre. Six acres are a large red apple, called the Pelican. This part realized me \$400 per acre. The rest of this orchard is in Orange Pippin, and some old varieties that are not of much account.

"I have a young orchard of 40 acres, set part in the fall of 1866—I much prefer fall planting—and the balance in 1868. This orchard is all early varieties; Red Astrachan, Orange and Codlin Pippins, Maiden's Blush, Lowell and Gravenstein are the principal kinds. I realized \$1,500 from this orchard this last year. About one-half has been lately grafted, and is not in bearing. I consider the selection of fruit trees very important, as my grafted trees blighted very badly this last year. This orchard has a great variety of soil, ranging from very sandy to a very heavy clay loam, and part of it very rolling.

"I attribute our having a crop this year throughout our section to its being the bearing year with us more than any particular cultivation."

WM. H. GRANT, RED BANK, MONMOUTH COUNTY.

"Yours of the 5th came to hand in due time. You speak of the large and profitable crops of apples raised in Monmouth county, which is true in some instances, in reality; in others, on paper, which is easier. Apples have attracted a considerable attention in our section for the last fifteen or twenty years, before

which time the orchards were small and the improved varieties few in number.

“The soil should be a strong loam; a little gravel will not hurt. For early varieties the soil may be more sandy. Location may be rolling, or flat; the flatter, the less liable to wash, as the orchard should be ploughed each alternate year, with no crops taken from the ground, except the fruit, after the orchard is ten years old. Fertilizers may be the same as those used for corn, the more the better.

“Now as to the varieties it is a difficult matter to decide—a nurseryman would name, say forty, while I, raising to make a living by selling the fruit—shall name but a few; first in order, beginning the season, the Bough apple, sweet and sour; the Primate, or Bell Rose, is a very nice and early apple, but too tender to stand shipping and worms get into the trees from the ground to the top; therefore I would not recommend the cultivation of them. Red Astrachan seems growing more into favor as the trees acquire age. For autumn the Orange Pippin heads the list a good bearer, ripens firm and hard and ships well. Then come Maiden’s Blush, Fall Pippin and Gravenstein and the Strand has done remarkably well in some orchards, as they are good. No apple will surpass the Baldwin in bearing or richness, but we are too far south for them to keep. Saulsberry stands first in my estimation and next the Pelican or Pinnock for shipping, and the Newtown Pippin is now doing very well.

“I have old and young orchards. Old trees only bear on what is called the *on year*, while young trees, by good cultivation, bear some every year. My proceeds have varied much both in quantity and prices. They have run from \$4000 for 900 barrels to \$1050 for 1400 barrels, with some 1200 bushels sent to the cider works. This year 550 barrels and \$750.

“I would add that capital is needed in the apple culture, as it takes fully ten years before young trees yield enough to give profits. Then for thirty years, by good cultivation, they are a safe investment. Varieties, which come in bearing early do not live so long as the kinds which do not bear so soon, as for example Monmouth and Orange Pippins, whereas varieties, like the Pelican, I find strong and vigorous at forty-six years of age. The Gravenstein comes in very late, but we do yet know about its longevity.

“My farming is of a mixed character, raising strawberries, blackberries, peaches and apples and potatoes, &c., &c., and I give with pleasure these facts for the information of my fellow farmers.”

FRANK PETTIT, MANNINGTON, SALEM COUNTY,

Writes, “During the last few years the orchardist has met with many disappointments in low prices of the fruit, blight of the trees, ravages of insects, &c., yet I do not see any cause for despondency. I believe the orchard still pays better than the growing of grain. We do not keep near so correct an account of our orchard products as we do of our farm products, at least this is the case with the general farmer. As a rule, farmers expect a crop of apples for twenty years without manuring, yet humbly submit to the demands of a grain crop by administering yearly a free application of some kind of fertilizer, and his vague idea of relative profits is based on gross receipts, forgetting all about expenses.

“I know an apple orchard of five acres, the sales from which have averaged yearly \$250 net, during the last twenty years. During that time it has only received one dressing of barn yard manure, one of lime and one of marl. It has furnished an abundance of pasture yearly, and the orchard is still productive and thrifty. The soil is not underdrained, is clay loam, is underlaid with a stiff, yellow clay subsoil, is nearly flat, sloping gently to the southeast.

“I have an orchard remote from the house, not convenient to pasture, that has been plowed twice yearly during the last twenty-five years.

“The incessant plowing and cropping finally rendered the soil absolutely poor, so poor that in an attempt to raise corn none would grow worth gathering. I seeded the orchard to clover, which grew to great size, and plowed it under the following year. The trees passed through a severe trial during the growing of the clover, some of them nearly succumbed, but the orchard has since been very vigorous and productive. This method of rejuvenating orchards is practicable only where an orchard has been plowed for a term of years, with or without cropping. This orchard of mine contains two acres, it has never been pastured,

yet I think the fruit as free of insects as any in the neighborhood. It has never entirely failed since it was old enough to bear fruit. Three years ago my sales from twenty trees amounted to \$150, and the only expense was picking. I think it is within bounds to say this orchard has averaged during the last twenty years \$100 net, yearly. About half of the trees have received one dressing of barn yard manure, and that is all the orchard has received since it was set. It is very difficult to say which are the best kinds of fruit for the orchardist to plant, as every six or eight years brings about a change of productiveness and vigor with some well established variety. Hence it is not advisable to plant too much of any kind, as by precedent we see it is probable that any variety may suddenly cease to be profitable.

"In planting fruit trees we should be governed more by our home orchards than by fruit books or traveling tree agents.

"In this county tree venders have done much injury in recommending Eastern varieties exclusively for winter sorts, as most of them prove only fall apples here, yet the wrong is somewhat neutralized by the extensive planting of trees brought about through pure business motives of the tree agents, which would not have been accomplished by local nurserymen.

"At this writing I would recommend for market the following named varieties:

"*Summer*—White June Eating, Princes Early, Hagloe, Red Astrachan, Primate, Duchesse of Oldenburg.

"*Autumn*—Porter, Gravenstein, Maiden's Blush, Red Streak, White Long Island, Baldwin, Fall Pippin.

"*Winter*—Cooper Redling, Smith's Cider, Turn the Lane, Ben Davis.

"For home use:

"*Summer*—Lippincott, Early, Princes Early, Primate, Duchesse of Oldenburg, Summer Pearmain.

"*Autumn*—Porter, Gravenstein Fall Pippin, Red Streak, Smoke House, Brown's Fall, Baldwin.

"*Winter*—Turn the Lane, Roman Stem, Green's Golden, Ben Davis, Wine Sap, Cart House, Cooper Redling, Smith's Cider.

"Only large apples are profitable for market, unless they ripen very early or are extra late keepers. A small fall apple is almost worthless when thrown on the general market. The requisites of a good market apple are about in the following

order: 1st, Productiveness; 2d, Size; 3d, Keeping qualities; 4th, Beauty; 5th, Quality.

"The manufacture of vinegar has become quite an important item in our orchard products, hence the selection of productive varieties without regard to size or quality is frequently made by planters.

"I think the average apple orchard in this county during the last ten years, with good management, would pay fully as well as grain crops, by manufacturing the late fall and early winter fruit into vinegar, to say nothing about sales and the use of summer and early fall apples, a good supply of late winter apples, and pasture furnished for stock."

ON SUGAR BEETS AND THE MANUFACTURE OF BEET SUGAR.

The manufacture of sugar from beets has been a leading branch of industry in various countries of Europe for a number of years past, and it is so successful there that it is constantly extending in the amount produced, and in the number of manufactories. In our own country very little has been done. An establishment, in which large capital was invested, was built near Chicago, Ill., but it was unsuccessful. It is said that a smaller one in Wisconsin is working successfully; and that a similar establishment has now been going successfully for several years in California. An extended series of experiments has been made at the Massachusetts Agricultural College by Prof. Goessman, which proves that beets can be raised there which are as rich in sugar as those grown in Europe. Beets have also been grown for three years upon the Agricultural College Farm, at New Brunswick, N. J., which were carefully analyzed for sugar, and the results proved that both in quality and quantity they were equal to those grown abroad. In 1871 the Silesian variety yielded 16.8 tons per acre, and the Nursery (a French, Vilmorin beet) 9 tons. The sugar in the former was 11.04 per cent., in the latter 8.24 per cent. In 1872 the yield from seed sent by the Department of Agriculture, Silesian, was 14 tons. The yield of the same variety in 1873 was 15 tons per acre, and the sugar amounted to 8 per cent. And many friends of home industry have made

efforts to draw attention to this promising branch of manufacture.

An enterprise to test the capabilities of our State for this manufacture, has been begun this year at Batsto, in Burlington county, by Joseph Wharton, Esq. It is on a large scale and will require several years to carry it through completely. On the 14th of November last Mr. Wharton made an exhibition and explanation of his undertaking to an invited company of gentlemen. The secretary of this board was among them. The experiments were made at the old Batsto estate, which is about six miles north of Elwood Station on the Camden and Atlantic Railway. The following is Mr. Wharton's statement:

"GENTLEMEN:—It seems to be expected that something should be said about the nature of the enterprise you have here seen the beginning of. I suppose all of you know that the manufacture of beet sugar is one of the principal industries in every country where it is carried on. In this country it may be equally so but as yet it has not been undertaken in such a way as to secure successful results.

"Ten years ago my attention was drawn to the necessity this country was under of endeavoring to produce sugar from beets. After reading whatever I could find upon the subject, and thinking the matter over, I went, in 1873, to Europe, and there examined several beet sugar establishments, becoming personally familiar, to some extent, with the elements and conditions of the problem. I learned there tolerably well what conditions were necessary to insure success here.

"In Europe the business of raising beets for sugar is carried on in two ways: either one large proprietor, or one company owning a great deal of land sets up a beet sugar establishment, or, on the other hand, a large number of persons contract with a sugar establishment to plant a stipulated number of acres per annum in beet roots, and to sell the crop to that factory at a given price. The first of these plans is the most usual in Germany, and the second is common in France. In many and perhaps the majority of cases these two plans are combined; the sugar works owning some lands, and, besides working them, also buying the crops of neighboring cultivators.

"When we come to apply these methods to this country we find the following embarrassments: first, there is not in this

country a class of persons owning large enough tracts of land to make the project successful. Abroad it seems to be considered essential that there should be an annual crop of beets from about a thousand acres in order to get an establishment into permanent operation. It is requisite that the crop should be as large as this in order that the factory may be large enough to make it to the best advantage. To obtain the crop of a thousand acres of beets annually, there ought to be from 3,000 to 5,000 acres devoted to that special purpose, because to secure proper results different crops must be cultivated in rotation, so that upon any particular field beets should come in but once in three, four or five years. Now in this country there are but few estates of sufficient magnitude for this purpose, and not only are there no such estates, but it seems, in most places, almost impossible to form them. Suppose a company should wish to establish a factory upon this extensive scale, and should find a locality suitable for it. They would be very much embarrassed to buy, at reasonable prices, five thousand acres of contiguous lands.

“Our system of settlement never having admitted of the parceling off of lands into great estates, but having from the first divided the lands into small ownerships, our people think that is the way in which land ought to be held. They also become attached to their homes and do not want to sell, or they see a chance of driving a good bargain by holding off, so that it is very difficult to get five thousand acres of land suitable for this purpose under one ownership. The other plan, of bargaining with neighboring cultivators, seems likely not to succeed very well. Not at least until after the culture has been established as a profitable one. In England small land owners are very well pleased to make bargains by which they engage to plant in beets certain acres of their estate for fifteen years or longer, fifteen years being the usual period they agree upon. In this country it seems unreasonable to expect that plan to succeed where cultivators know so little about the sugar beet, and have so little reason to expect contractors to keep such bargains; where moreover every one likes to maintain freedom of action, to sell out and go West, holding his lands in the market all the time, even though he might refuse to sell if applied to.

“On considering how to overcome this fundamental difficulty, and, still further, the different soils and localities of this country,

I thought it very likely that Jersey sand might prove to be suitable for raising beets if properly cultivated and manured, and with that view, knowing that land was held here in large tracts, I began to purchase land in this neighborhood. Having thus plunged into trouble, as persons are apt to do, I got constantly further into difficulty, in trying to make better boundary lines by exchanging with a neighbor, or by buying from him some part of his tract. I usually found him indifferent; generally he would not sell the part desired, but would sell the whole tract. I finally was drawn along into purchasing a total of about sixty thousand acres.

“As for the actual experiment of determining whether this climate and soil are suitable for producing beets, that is something which will require time and patience, laying out of money, year after year, until the question is definitely settled. The experiment of raising a few beets in a garden demonstrates almost nothing. Even the experiment of raising a field of beets, and then having them examined by the polariscope to determine the quantity of sugar, demonstrates but little more. Until some continuous effort results in financial success people are unwilling to expend their money in raising beets as an industry. Enough beets must be planted to be worth working, and if they turn out in quantity and quality worth working, apparatus must be erected to ascertain what they will yield. Doing this has resulted in what you have seen to-day.

“Of the fifteen acres that I planted, about five acres failed utterly. The seed did not take, I think on account of having been planted too late. Ten acres yielded about sixty tons, or rather less than one-half of what is habitually produced in countries where this culture is well established. My beets do not contain, as those in Europe sometimes do, twelve or more per cent. of sugar, but they show about eight per cent. This is more than European beets used to contain when the industry was young, but the yield in the best situations in Germany, and in exceptional cases, is now fifteen or sixteen per cent. We may fairly expect, starting at eight per cent., to attain, by careful cultivation, and in due time, ten or twelve per cent., though no one can certainly tell whether our climate and soil will yield better beets than we have now.

“In whatever section of the country the experiment may be

made, the cultivators must learn, after repeated trials, what their own soil is capable of yielding. I have no doubt myself that over a large part of the Union there will be found lands capable of yielding beets worth working for the sugar contained in them. Although this business, like every other, will require diligence, perseverance and fortitude on the part of those undertaking it, and will require a class of men who will not be put down by inadequate results in the beginning. Wherever competent persons in suitable localities take the matter in hand, holding on to it, making improvements where improvement is shown to be practicable, they will finally arrive at satisfactory results. I think this, all difficulties taken into account, the most promising industry now before the American people.

“ According to the last statement of the bureau of statistics, about \$90,000,000 worth of sugar and molasses was imported into the country during the year ending June 30, 1877, costing us doubtless, freight and profits included, \$100,000,000. There is \$100,000,000 going out of the country for saccharine, all of which ought to be produced at home. What Louisiana and Florida cannot produce in cane, we of the North ought to obtain from the sugar beet. There is a drain upon this country for sweetening alone equal to the interest upon the entire public debt. You can then imagine what the result would be should the cultivation of the sugar beet here in this country prove thoroughly successful.

“ It is not only the stoppage of that drain which would be accomplished, but also improvements in agriculture would be obtained. Wherever beets have been raised upon a large scale, the land has become far better for other crops. The beet does not exhaust the land and make it unfit for other things, as tobacco does, but exactly the contrary takes place. The offal, consisting of the tops of the beets, and the material from which the sugar has been extracted, forms a most admirable fattening substance for cattle. Where the beet culture has been introduced to very great extent, the raising of cattle has been immensely extended. This results in greater fertilization and the beet culture is rendered not only a paying business in itself, but is followed by the certainty of an increase of all other sorts of agricultural wealth.

“ Not less than one million acres of good farming land in the

Northern States could most profitably be devoted to the culture of sugar beets to obviate the present enormous importation of sugar. That would withdraw this large quantity of land from other agricultural products, relieving the markets for those other products from the competition of that immense acreage. Of course this \$100,000,000 which we pay for sugar is merely what we are now wasting unnecessarily. As the country grows in population, it does not merely consume sugar in the same increasing ratio, but the consumption per capita, increases. It is only a few years comparatively since sugar was first manufactured. If you look back to the time of Queen Elizabeth sugar was then an extremely scarce article, and it has but very gradually crept into use, until now it is considered one of the most necessary articles of food. In view of the numerous prospective demands of this country for sugar, it is easy to see that if we continue to buy it almost entirely from other countries, as we have hitherto done, the nation will be shorn of its financial independence, for we cannot furnish those other countries with any of our productions sufficient to pay for their sugar, and we must therefore pay the chief part of the monstrous sum in gold.

“In regard to the experiment which has been carried on here, it is hardly enough developed to waste your time by dilating upon it. After further experience has been acquired and more exact results have been obtained, the matter may be put in form for publication, but at present the project is in no shape to give results accurate enough to be particularly interesting. At present, I can only say that the power of producing a marketable product seems to be demonstrated. As to the various ways of treating the beets after they are grown, that is a large field in itself; more than enough to occupy all your time, and it is therefore impossible to enlarge upon that subject. The course of experiment tried here was decided upon after a consideration of the plans adopted abroad, and was made to suit the present circumstances; that is, a tolerably complete apparatus was devised and erected, but upon a small scale.

“Unless prevented by something now unforeseen the experiment will go on, year after year, until some sort of definite result is obtained. If it proves not to be satisfactory, that result will only be reached after several years of patient endeavor. In regard to the process of manufacture adopted here, if any curiosity is felt,

Mr. Humphrey can give any information that may seem necessary."

Mr. Humphrey said :

"I feel very much gratified in seeing so many faces here, because it shows that quite an interest is taken in the matter to which I have devoted considerable attention for some time past, and of the success of which I feel there is no doubt.

"The beets are dug up and piled in heaps, according to the time of the year. If we intended to use them the latter part of the year, they would be buried in pits; as it is now, they are merely piled in the fields to protect the roots from the frost. The beets are taken to the factory, where the heads are chopped off, care being taken not to chop off too much of the top. The upper portion which has grown out of the ground, that is, the head and the leaves, are salted down in a pit, and upon this is placed a layer of the beet pulp, from which the sugar has been extracted, and so on until the pit is filled up for about seven or eight feet in height. The earth is heaped over it, the mass gradually sinks, and fermentation sets in by the first of January. By this time the leaves and heads have become a very palatable food for the consumption of cattle. After thus chopping off the portions containing no sugar, the beet is next passed through a washing machine, and it is important that this washing should be thorough; if there should be a stone left, it would injure the teeth of the rasp through which the beets next pass. The beets are thrown into the rasping machine through the hopper on top. The resulting pulpy mass, which is mixed with a little water, is put into a centrifugal press, revolving about 800 or 900 times per minute. The juice thrown out runs into a tank in the cellar, and the pulp is taken out and packed in pits, as already explained, ready for use in the winter for feeding cattle. This refuse product is very valuable, being worth four or five dollars a ton. The juice is pumped up into tubs in the third story, where it is treated with lime and heat, applied with caution, until it is just at 212 degrees. The heat is then suddenly withdrawn and the albuminous substances in the juice are thrown down; a scum is formed, and after waiting a few minutes, the juice is again drawn off clear and run through bag filters. Eighty-five gallons of juice are obtained from 750 pounds of beets, which is equal to about 240 gallons of juice from a ton of

beets. The residue in the filters is pressed, and when thus freed from juice is an excellent fertilizer, containing phosphate and nitrogenous matters, albuminoids, &c., mixed with lime. The clear juice, after being run into iron kettles, is concentrated there to 20 degrees Beaume. During this process acid is added from time to time, which takes from it the excess of lime used during clarification.

“There are now two methods which may be followed. The first we adopted was running the juice through bone-black, which eliminated a certain amount of coloring matter. This was again passed into a kettle, and boiled down to 32 degrees. This finished product I exhibited, the other day, to one of our sugar refiners, and he gave me authority to say it was worth 30 cents a gallon. When further evaporated down to 30 degrees it showed remarkably fine crystals of sugar, really becoming a caked mass of sugar crystals, something which does not happen with ordinary molasses. On account of the expense of bringing bone-black here, and not having any kilns to re-burn it, it seemed best to change that process, and concentrate without passing through bone-black. The disadvantage of passing the juice through bone-black is that it tastes of sulphur, and, after being passed into iron kettles sulphide of iron is formed, which discolors the syrup. The product we now get is simply the juice after clarification and treatment with sulphuric or carbonic acid, evaporated down to a consistency to fit it for the market.”

He also gave the following statistical information :

“Allow me to call your attention to the following statistics and statements which have been compiled to show the importance of the beet root sugar industry, its agricultural and manufacturing status.

“The following table exhibits the comparative amounts of beet root and cane sugar produced, in the years 1875-76, in the world, and in the case of the beet, the amounts produced in the various European countries :

German Empire.....	346,646 Tons.
France.....	462,259 “
Russia and Poland.....	245,000 “
Austria and Hungary.....	153,922 “
Belgium.....	79,796 “

Holland and other countries.....	30,000 Tons.
Total tons beet sugar.....	1,317,623 “
Total tons cane sugar.....	2,140,000 “
Total production of raw sugar.....	3,457,623 “

“ Thus, more than one-third of the sugar produced is obtained from the beet.

“ The average yield of an acre in Germany is 11.7 tons. The tax paid upon this quantity is \$45. This amount would be a great offset to the greater cost of cultivation in this country. No data can be found to establish at what price beets may be raised here. Estimates have been given, which vary all the way from sixty-four cents to four dollars a ton. The average of the results of the experience of eighteen persons is two dollars and forty-two cents per ton. (See *Scientific American*, April 3d, 1869). These estimates, I think, should not be relied on, as the cost would probably reach three dollars per ton; there are also no sufficient data to show the amount of beet roots which can be raised to the acre in this country.

“ The following tables will elucidate these points as regards Germany, France and Russia. These estimates were made some years ago but will serve to give a general idea of the amount raised per acre :

COST OF PRODUCTION, THE DIVISION OF EXPENSES INCURRED.

	Germany.	France.	Russia.
Rent and manure.....	\$18 73	\$38 31	\$12 39
Cost of production.....	14 28		12 39
Tax	42 30	49 58	13 52
Cost of Manufacture.....	50 47	69 11	50 70
	\$125 78	\$157 00	\$89 00
Tons of beets per acre.....	11.6	17.9	9.2
Per ct. sugar extracted.....	8.	6.	6.
Lbs sugar extracted per acre.....	2.078	2.403	1.236

“AS REGARDS THE COMPARATIVE YIELD OF THE BEET AND CANE,

In Louisiana, the average yield per acre is about seventeen tons and five per cent. is extracted.

Amount of sugar produced per acre in Louisiana	1904 lbs.
“ “ “ “ “ “ “ foreign cane districts.....	1600 to 4800
“ “ “ “ “ “ “ Germany.....	2078 lbs
“ “ “ “ “ “ “ France.....	2403 lbs.
“ “ “ “ “ “ “ Russia.....	1236 lbs.

“Only one-eighth of the amount of sugar consumed in the United States in 1875 was produced in Louisiana.

“The following is an estimate which I have made upon the returns of a manufactory consuming fifteen million pounds of beets in one hundred days. The manufactory would cost about sixty thousand dollars. Stock of bone black (75,000 lbs), \$2250. Gross, \$81,655. Total, \$107,233. Profit, \$25,579.

“I have considered four dollars per ton a fair price to pay the farm for the beets. Should it be possible to raise the beets for three dollars a ton, there would be for a farm of 578 acres, the net profit of \$6,704 which is to be added to the above profit if the manufacturer cultivates his own beets. $8\frac{1}{2}$ cents per pound is a low estimate for raw sugar. Several refiners whom I have consulted, consider the value to be $8\frac{3}{4}$ cents. I have considered the yield of sugar as 8 per cent., although last year in Germany it was 9 1-10 per cent. I have calculated the press cake as worth four dollars per ton. This is a low estimate, Dr. Goessman, a gentleman who is perhaps better acquainted than any one in the country with the facts which bear upon the industry considers that the value of the press cake is \$17.40 per acre, this would make the total amount for 578 acres \$9,157 instead of \$4,908. I have thought better to choose the latter sum as there would be a certain prejudice to be overcome before the farmers would be willing to pay the real value.

“The foregoing are a few of the facts which I have chosen to present to you and which have been carefully selected, and I think in respect to the estimates fairly stated.

“My views as regards the establishment of this industry are as follows:

“Starting out with the idea that the important point to be es-

established is how cheaply can beets of good quality be produced in this country, I would have a company formed of capitalists who are willing, if the preliminary experiments should prove successful, to furnish about \$150,000 capital. Two or three farms of from twenty to twenty-five acres should be hired, in selection where the climate and soil appear favorable. These should be cultivated at least two years with beets according to the method adopted in Germany and France. It appears to me of no use to trust the raising of the beets to farmers alone. The experiment has been tried repeatedly, and it has proved almost impossible to overcome their prejudice as regards the proper method of cultivation. The amount of beets produced, the per cent. of saccharine matter, etc., the total cost should be carefully noted. If it was desired the raw sugar could be extracted, although this is not essential, as the subject has been so well studied abroad that the amount of sugar obtainable from a beet of a certain quality could be very closely estimated. From these experiments the amount and cost of raising the beet could be fairly calculated; if the results should be satisfactory, the land could be purchased and the manufactory built. The experiment would not be expensive as the crop of beets could be sold, and go far to repay the outlay. It is of course not probable that as satisfactory results as are figured will be obtained for several years, but there seems to be little doubt that Government and State aid might be obtained. Already in Canada they have offered \$7,000 a year and exemption from taxes for ten years to the first manufacturer. In Maine the same inducements are offered, one cent a pound until the amount reaches \$7,000, with that surety, capital would run small risk in making the venture.

“I have presented the foregoing facts to you, hoping that I may receive your opinion as regards this matter, and also that you will criticise any statement which you may not think correct. Any such remarks or criticisms which you may be pleased to make will be very much valued, as I am anxious in bringing this matter before the public, that no errors should be made, no expectations excited which will not be realized

“The whole matter if started must be carefully considered, and carried out with extreme caution, as one failure, even if due to some mistake on the part of the management, would result most disastrously to the undertaking.

“Should you feel any interest in this matter, or should know of any one who would be anxious to inquire into the subject, please inform me, as in undertaking this enterprise it is necessary to concentrate all efforts to be made in this direction.

“H. C. HUMPHREY.

“Philadelphia,

“Laboratory 113 Walnut street.”

The cultivation of the sugar-beet is of so much importance, and there is so little experience in our country in regard to it, that it has been thought best to insert here from Crooke's work on the manufacture of beet sugar, directions for the choice of soils, fertilizers, &c., most favorable to their growth.

“*Soil.*—The beet vegetates in all soils, but it thrives better in a sandy loam or an argillaceous soil. In chalky soils, or very sandy ones, its development is stunted. It prospers in light siliceous ground, if this be rich in humus or in manure. A medium consistence between stiff and light is the best for it, but too stiff soils are preferable to too light ones. The best soil must be loose, fresh and free from stones. If water is contained in the subsoil it must be artificially drained. A certain amount of lime in the soil is advantageous, but it must contain no *excess* of potash or soda, as these salts have a deleterious influence on the ulterior production of sugar during the process of manufacture.

“It is better, for many reasons, not to grow beets as a first crop on newly cleared lands. This plant having a long, taper root, the radicles of which penetrate far down into the ground, the necessity of a deep and well pulverized soil is apparent.”

Respecting the most suitable soil, another says: “The land most suitable for growing beet is that on which the soil is free from peat and salt, but is rich, light and loamy. Clay land is too cold; the roots do not easily penetrate it, and they would be deficient in saccharine matter. On moor-land and heavy marsh-land the result is the same; nor does dry, sandy soil, or soil with a hard, rocky bottom, yield a satisfactory crop. Stony ground also is to be avoided, as it cannot be thoroughly worked, while ground newly cleared contains matter detrimental to the sugar producing power of the beet. Experience has amply shown that the best crops, as regards both quantity and quality, come from a light, deep, argillaceous soil, free from excessive moisture and

acidity—a soil which has been long under cultivation and is not burdened with noxious weeds, whose exhaustion is repaired by continual improvement in the cultivation and by restitution to it, in the shape of manure, of what it has lost. As this root takes up three to four per cent. of mineral salts, lime, potash and soda, and as the bases of these may interchange one with another, all attempts to make good sugar from the product of salt lands, soil too much manured, or ground recently cleared of timber, are certain to be entirely futile. Sloping land, of moderate elevation, will give the best results. The most suitable soil for the purpose would be that which should contain four parts mould, fifty-six argil, thirty-six silex, and four carb. lime. From this about twenty tons per acre and twelve per cent. of saccharine matter are raised and extracted.”

“Respecting the character of the soil best adapted for the growth of beet root, Dr. Voelcker, in his paper ‘On the Chemistry of the Sugar Beet,’ remarks: Like other green crops, the sugar beet, though not equally well adapted for every kind of soil, is nevertheless grown on land varying greatly as regards depth, texture and general physical and chemical properties. It may, however, be observed at once, that all soils incapable of being cultivated to a depth of at least 16 inches, are unsuited for the growth of sugar beet, which, unlike the yellow, globe-mangel, grows almost entirely under ground, and therefore cannot be cultivated with advantage on very shallow soils. Peaty soils are not suited for beets, nor stiff, clay soils, and, more or less, all soils in a bad state of cultivation are unsuitable for its cultivation.

“The chief requisites in soil upon which this crop is intended to be raised, are a sufficient depth and ready penetrability by the plant. A good friable deep turnip loam, and all soils on which potatoes grow to perfection, are perhaps the most eligible of all for the growth of beet roots. A moderate or even large amount of clay, far from being an undesirable element, is very useful for this crop, provided the land is well worked and the clay has become friable by exposure to the air and by general good management.

“The subsoil has an important influence on this, as on all root crops. It should be sufficiently friable to allow the ready penetration of the roots, and be thoroughly well drained; for it

is vain to hope to grow successfully good sugar beets on land resting on a stiff, cold and partially drained subsoil. In dealing with rather heavy land, particular attention ought to be paid to autumn cultivation. Deeply ploughing in autumn and stirring the subsoil without turning it up, and above all steam cultivation, are some of the means of preparing such land for beet roots. In short, the same rules which apply to the cultivation of the soil for other root crops should guide the farmer in preparing his land for sugar beets.

“Preparations of the Ground.—The instructions for this purpose may be summed up as follows: Plow deep in the autumn or early winter; better twice than once. This may be done by two successive plowings with an ordinary plow, or by the use of a subsoil plow. The following spring pass a heavy iron-toothed harrow over the land, and follow this by a scarifier. After this spread the manure equally over the land, and plow it in to a depth of 4 or 5 inches. Harrow and roll with an iron roller so as to equalize the surface and break up clods, and the field is ready to receive the seed. These last operations must, if possible, be performed before the month of April.”

“Manure and Fertilizers.—Dr. Voelcker opposes the view that beet root can only be grown to perfection on light, very porous, and naturally poor soils; this he says is a great mistake, for on naturally poor sandy land sugar beet cannot be grown economically. Such land requires to be previously well dunged in the autumn, and to be liberally treated with superphosphate at the time of sowing, before it will yield a paying crop of beets. On the other hand there is no soil so well suited for beets, as a good, well worked, deeply cultivated, and thoroughly drained clay loam; or, in other words, a soil containing a good deal of clay, with a fair proportion of sand. Most good clay loams contain sufficient lime to meet the requirement of the beet root crop. Many light soils, on the other hand, being poor in lime, are much improved by the application of clay, marl, chalk, or quicklime previous to plowing up the land in autumn. On land deficient in lime the sugar beet is apt to get fingered and toed, and hence care should be taken, before taking the land in hand for the cultivation of this crop, to ascertain whether it contains a fair proportion of lime.”

A correspondent in France, writes on this subject as follows:

“The king of all plans for manuring beet is this. Before the winter, put on the land with a deep plowing, from 40,000 to 50,000 kilos; (40 to 50 tons) of farm yard manure to the hectare ($2\frac{1}{2}$ acres), i. e., 16 to 20 tons to the English acre; and follow this in the spring, with light plowing, by 2,000 kilos; (2 tons) of rape cake to the hectare (i. e., 16 cwts. to an English acre.) Land manured in this manner will not only give the richest quality of beet, but will, the year following, without any further manure, produce the finest possible crop of wheat. The leaves and tops can be left on the land as manure, and as such are worth 100 francs per hectare (i. e., \$8 per acre.) If they remain, the quantity of rape cake required will be only 8 cwts. per acre; but should they not be thus used, they can be collected as food for cattle, or left on the ground as food for sheep, or mixed with the pulp which is going to be preserved air-tight for a year or two. This last plan is strongly advocated by one of our greatest chemists, Mr. Corenwinder.”

“We may remark, that during the process of making beet-root sugar, many very valuable refuse, or so-called waste, substances are produced, all of which are of the highest value as fertilizers, and are carefully collected as such. These are: the waste dust, or refuse bone-black left after washing; the exhausted lime of defecation; the pressed scums; the worn out woollen sacks from the pulp presses; the ashes from under the boilers; the small roots and rootlets from the root washers; and, finally, the dung of the animals fed upon the beet-root pulp after the sugar has been manufactured therefrom.

“In his pamphlet already quoted, (p. 37), Mr. Baruchson says, that the presence of salt is above all things inimical to the production of sugar from this root. Consequently, whatever increases its saline qualities—proximity to the sea, solar action on the portion above ground, the use of land or manure impregnated with salt—is a serious obstacle to success and must be avoided. In some instances Mr. Baruchson says, that the undue proportion of salt in sugar has nearly rendered the sugar unsaleable; and so generally is this recognized abroad, especially in Germany, that the manufacturers, in contracting with the growers of the root, stipulate that it shall not be grown on certain soils and often even name the manure which shall be used; they also frequently provide the seed themselves, to ensure the right quality

being grown. It is of the highest importance that care be taken to avoid errors here. One per cent. of salt destroys five per cent. of sugar, and thus root produced from the wrong soil will disappoint all concerned. Farm-yard manure, for instance, should be used moderately. Rape cakes, bones and guano, are especially recommended; lime, also, is very good; and generally whatever is principally composed of carbon; thus all decomposed plants are valuable for the purpose. The manuring should take place only during the autumn preceding the seeding."

Seed.—The sugar-beet is a variety quite distinct from those commonly cultivated for table use or feeding stock. They are mostly white, small sized and grow almost wholly in the ground. The seed used in this country is, as yet, imported from France and Germany. It should be bought freshly imported from a trustworthy and intelligent dealer. From 10 to 12 pounds per acre are needed. The seed may be soaked before planting. It is planted in drills from 18 to 30 inches apart according to the richness of the soil, and the plants are from 8 to 12 inches apart in the rows.

The cultivation is then the same as for other root crops.

The time of planting is in the latter part of April or the beginning of May.

The crop is valuable one for cattle feed, and there need be no losses incurred while learning how to grow them for they can always be fed on the farm with profit.

The legislature of 1872 passed a law exempting beet-sugar factories from taxation for ten years.

NEW JERSEY CRANBERRY GROWERS ASSOCIATION.

This association is actively at work. Their fifth annual convention was held at New Egypt, Ocean county, on the 4th of September last. There was a very free discussion and comparison of observations in regard to the scald or rot which is so damaging to the crop, but no conclusion was reached as to its cause, or any successful method given for counteracting its effects. The statistician of the association made the following report:

The receipts of New Jersey cranberries at New York from

January 1st until the close of the seasons have been from the crops of the years named as follows, in bushels :

	1874.	1875.	1876.
By N. J. S. Railroad.....	6,626	3,215	7,238
By Pennsylvania Railroad.....	4,007	6,181	5,057
Totals after January 1st.....	10,633	9,396	12,295
Receipts by same roads from commencement of seasons to December 31st.....	51,074	65,561	41,532
Totals from New Jersey.....	61,707	74,957	53,827
Total receipts from New England from crops of same years...	40,000	12,000	25,000
Total receipts of New York.....	101,707	86,957	78,827

The only daily record of receipts of cranberries is kept by the two railroads above named for the benefit of this association. The receipts from New England are estimated from best obtainable sources, while some cranberries brought by New York and Long Branch Railroad, and from the State of New York, are not taken into the amount. The actual receipts therefore exceed somewhat the above figures.

The crop estimates of the country for the last five years are as follows :

	1872.	1873.	1874.	1875.	1876.
Cape Cod and adjacent Islands.....	20,000	80,000	70,000	50,000	40,000
Massachusetts, Rhode Island and Connecticut.....	20,000	25,000	35,000	25,000	25,000
New Jersey.....	100,000	110,000	90,000	110,000	90,000
Wisconsin, Minnesota, Indiana and Michigan.....	135,000	60,000	50,000	40,000	40,000
New York.....	.....	.....	5,000	5,000	3,000
Totals.....	275,000	275,000	250,000	230,000	198,000

From the foregoing it appears that the receipts from the New Jersey crop of 1875 were 22 per cent. greater than from that of

1874, and 37 per cent. greater than from that of 1876; while the receipts from New England from the crop of 1875 were 70 per cent. less than from the crop of 1874, and 52 per cent. less than from that of 1876. But the entire receipts at New York from both sections have diminished in each of these years—those from the crop of 1875 being $14\frac{1}{2}$ per cent. less than from 1874, and the receipts from the crop of 1876 8 per cent. less than the preceding year.

Of the entire crop of New England, the proportion sent to New York from last three crops has been as follows: Crop of 1874, 38 per cent.; 1875, 16 per cent.; 1876, 38 per cent.

Of the entire crop of New Jersey for the same years, New York received from crop of 1874, 68 per cent.; 1875, 68 per cent.; 1876, 60 per cent.

The entire crop of the country has, by our estimates, diminished year by year from 275,000 bushels in 1873 to 198,000 in 1876.

A careful investigation by a valued correspondent in San Francisco shows shipments by rail across the continent to that market, in bushels, as follows:

1873.	1874.	1875.	1876.
4,365	11,265	9,015	7,123

The large shipments of 1874 and 1875 are said to have overstocked that market to the serious loss of most parties interested.

I have no record of the exports to Great Britain and the Continent, but I think the quantity of the last year greater than ever before, and amounting to between 2,000 and 3,000 bushels.

The small crop of 1876 naturally inspired the hope of good or even high prices, both among growers and dealers, and among the first transactions was the sale of the largest Cape Cod crop to a Boston firm at about \$10 per barrel.

“An enormous apple crop and almost unparalleled hard times were not expected to prevent high prices for cranberries consequent upon a short crop.

“My experience prompted the remark in my report of a year ago, that with the difficulties then imminent, it would be easy to check sales by too great firmness of price, so as to carry beyond the period of greatest consumption so large a portion of the

small crop that the bi-yearly occurrence of low prices in the spring, which has in this fruit prevailed during the last eight years with such singular regularity, would not be averted. This apprehension, I am sorry to say, was abundantly fulfilled. Hard times, and apples at \$1.50 per barrel, proved too much for cranberries at even \$3 per bushel, and the rosy expectations of \$4 or upwards, came to early grief.

“At the present time the tables seem to be in the matter of production, turned. A large cranberry crop is maturing, while the apple crop is believed to be quite light. The apple crop is also reported small in England and on the Continent. The cranberry yield of the country will, from present appearances, be greater than at any time since 1873, and may exceed all previous productions. The area of consumption has been steadily increasing, but the possibility of disposing of so large a crop at remunerative prices will for the next few months be an open problem, taxing the ability and discretion of those interested.

“This leads me to remark once more upon the methods and policy of marketing the fruit. My experience indicates that to accumulate large stocks in New York to hold under limit or otherwise for a future market, is poor policy. The fruit, if well protected, keeps much better in the country in open boxes as it comes from the hands of the pickers, than it will after being cleaned, packed and transported to the city. Besides, when the natural shrinkage has for some time gone on in the city, the freshness of a *tight* full package disappears, and ere long the separator must again come in play, involving a large loss in quantity, and much city labor at somebody's expense. I advise, therefore, as a general rule, that the fruit be sent to market only as fast as it is expected to be sold on arrival or within a few days. Storage and labor for its care, when the market does not suit, are much cheaper in the country.

“With the abundant crop now in prospect, honest, competent and careful packers, who use standard packages, make their lots uniform in quality, and *press* the fruit in so that it will arrive in market *tight full*, will have great advantage, both in prices and promptness of sale.

“In conclusion I must have another shot at the undersized packages.

“Nobody can dispute the convenience or the honesty of pack-

ages for this fruit of uniform shape and size; and great good has resulted from the introduction by this association of a prescribed standard for crates and barrels. So obvious are the advantages of this standard that it is hard to find an honest motive for using packages either larger or smaller. I am not aware that any one in New Jersey has sinned of late years by using crates *larger* than the standard—the departures have all been in the direction of smaller sizes. These have been numerous enough to cause much dissatisfaction in New York by the small swindles thought to be thus attempted. Respectable dealers have been bothered and perplexed with them, and never more, I think, than during the last season. From the expressions I have heard in the trade I think the scrimping policy will hereafter find less tolerance or sympathy. I know one firm at least that will take good care not to sell scant crates at the price of standard sizes. The association should by all proper means continue its efforts for the suppression of undersized packages.

“N. R. FRENCH,

“180 Reade Street, New York.

“Sept. 3, 1877.”

The first meeting of the year 1878 was held in Trenton, Jan. 22d. The President, Rev. Dr. Brakeley, delivered the opening address, and Mr. French presented the following

STATISTICAL REPORT.

On the 15th of September last, I issued the annual postal card inquiries to cranberry growers, in regard to the amount of the crop and its condition as compared with the preceding year.

In response to over 300 inquiries I received 102 replies, viz: From New England, 67, from New Jersey, 29, from New York, 6.

The footings of the sixty-seven returns show that these growers raised in 1876, 18,287 bushels, and estimated their crop of 1877 at 27,902 bushels, or an increase of $52\frac{1}{2}$ per cent.

But the cranberry section of Cape Cod and adjacent islands furnished only one-third in number of these returns, while the number of growers, the aggregate raised, and the excess of the last crop over the preceding, are in each instance believed to exceed the balance of New England.

The twenty-nine returns from New Jersey show an aggregate of 14,599 bushels in 1876, and 24,618 bushels in 1877, or an increase of 69 per cent.

From New York State the footings are 1,841 bushels in 1876, and 2,170 bushels in 1877, or an increase of 15 per cent.

The receipts from the New Jersey crop at New York from commencement of season to January 1st, 1878, have been as follows: New Jersey Southern R. R., 45,502 crates, 829 barrels, Pennsylvania Railroad, 14,222 crates, 282 barrels, aggregating by these two roads 63,057 bushels.

The receipts by the New York and Long Branch Railroad and other routes, will swell the amount to, say 70,000 bushels, against, say 45,000 bushels for the same time of previous season.

The receipts at New York from New England, of which I have definite information, amount to nearly 15,000 barrels, and I presume 5,000 barrels have been received through other channels, making say 60,000 bushels against 24,000 bushels for the same time last year.

“The receipts from the State of New York have been about 5,000 bushels, so that upon this calculation the receipts at New York have up to January 1st been 135,000 bushels, or a little over double the receipts at the same time a year ago.

“A summary of receipts at New York from commencement of season to Dec. 31st from New Jersey and New England for the last four years shows as follows:

	1874	1875	1876	1877
New Jersey.....	51,074	65,561	44,582	70,000
New England.....	40,000	12,000	24,000	60,000
Totals	91,074	77,561	68,582	130,000

“The ‘Barnstable Patriot’ of Dec. 29, 1877, publishes an official statement of shipments of cranberries for the season prior to that time from Cape Cod amounting to 34,743 barrels. Shipments from adjacent islands and from the base of the Cape by other routes, are estimated at 6,500 barrels, and there are believed to be at least 1,000 barrels remaining on the Cape the last of December. This would make the Cape Cod crop amount to 126,729

bushels, against 40,000 bushels—the estimated crop of 1876, or about three time the previous crop.

“For Massachusetts (exclusive of Cape Cod), Rhode Island and Connecticut, the estimate of 1876 was 2,500 bushels, and an increase of 50 per cent. may be fairly reckoned, making 37,500 bushels for 1877.

“The entire crop of New England would therefore be 164,229 bushels, or fully 250 per cent. greater than the crop of 1876.

“The New Jersey crop of 1876 was estimated at 90,000 bushels. The increase indicated by the returns mentioned from twenty-nine growers would make the crop of 1877, 152,100 bushels, nearly half of which had by the above showing reached New York before New Years.

“A detailed statement shows that the three largest marshes in Wisconsin yielded in round numbers 10,500 barrels. The balance of that State is estimated at 14,500 barrels, with 1,500 barrels for the entire yield in other Western States. This gives a Western crop of 79,500 bushels, or about double the crop of 1876.

“Bringing forward previous crop estimates and affixing the above footings we have the following comparative exhibit for six years—the figures representing bushels:

	1872	1873	1874	1875	1876	1877
Cape Cod and adjacent islands....	20,000	80,000	70,000	50,000	40,000	126,729
Massachusetts, Rhode Island and Connecticut.....	20,000	25,000	35,000	25,000	25,000	37,500
New Jersey.....	100,000	110,000	90,000	110,000	90,000	152,100
Wisconsin, Minnesota, Indiana and Michigan.....	135,000	60,000	50,000	40,000	40,000	79,500
New York.....			5,000	5,000	3,000	5,000
Totals	275,000	275,000	250,000	230,000	198,000	400,829

“This figuring makes the crop of 1877 46 per cent. greater than the largest crop previously on record.

“The shipments to San Francisco of the fresh fruit for the last five years have been as follows, in bushels:

1873	1874	1875	1876	1877
4,365	11,265	9,015	7,123	9,113

“Of these shipments from the crop of 1877, there were 470 crates from New York, the balance being in barrels about equally divided between Wisconsin and Cape Cod. A large part of these shipments is said to have arrived in poor order, or to have kept badly, and resulted in serious loss.

“In my report to the Association in September last, I remarked that ‘the cranberry crop of the country will, from present appearances, be greater than at any time since 1873, and may exceed all previous productions,’ but I did not expect a yield of fully 50 per cent. above the largest previous crop.

“When a barrel of apples and a bushel of cranberries cost the same, the two fruits are about equal in economy as a table sauce. These are the leading fresh fruits of this country for Fall and Winter use, and their relative market value the past two years has been curious if not instructive.

“During the season of 1876–7 good apples sold in New York in a wholesale way at \$1.25@ \$1.50 per barrel, yielding a little or nothing to the grower for the fruit. The cranberry crop of that season was very light, and during the first four months, up to January 1, 1877, the market price was \$2.50@ \$3 per bushel, but from this point cranberries declined until not over half the fall prices could be obtained for fair fruit in the spring.

“This season the tables are turned as to production. The early expectations of a light apple crop have been realized, and prices have been more than double those of a year ago, while the cranberry crop has doubled and prices have fallen nearly one-half, the bushel of cranberries selling thus far for about half the price of a barrel of apples.

“Three remarkable instances of loss to growers from over production have recently occurred, viz.: The peach crop of 1875, the apple crop of 1876, and the cranberry crop of 1877. Cranberry growers were also unfortunate in having their very small crop of 1876 nearly swamped by the deluge of apples in that year. The apple crop has been greatly helped by the export demand, which took from the crop of 1876, 201,274 barrels, and from the crop of 1877 up to January 1st, 1878, 48,180 barrels.

“The Fruit Growers’ Trade Company, an outgrowth of this association, has made diligent and persevering efforts to work up a foreign demand for cranberries, but with limited success. The low prices of the present season with the relatively high price of

apples, seemed to indicate a most favorable opportunity to push both the fresh and the prepared fruit into use in Great Britain and elsewhere. Early arrangements were made for weekly shipments to be continued as long as the cable reports of sale would warrant. The first consignment gave a small profit upon a cost in New York of \$2.25 per bushel crate, but all the subsequent consignments made a loss upon a cost in New York of \$2 or less per crate. Special efforts to stimulate the demand in the Southern States have shown but very small results.

“New Jersey has encountered unusual difficulties this season. Heretofore I have remarked upon the growing popularity of your distinctive packages, an essential reason for which was the better keeping of the fruit in bushel crates than in barrels. The color of the fully matured healthy fruit has this season been poorer than common. A large amount has for the past few years been picked very early and hurried in an immature or unhealthy state to market. It has followed from this that fair looking fruit would at the end of a few days' transport or a few days in store show considerable decay, and bring disappointment and loss to the purchaser.

New Jersey being first in market has opened the trade with her poorest fruit. Then comes Cape Cod with her finest berries, in tight packed barrels, filling all the channels that radiate from New York, and discrediting the Jersey crates which have already gone over the same tracks filled with the poorest part of the crop. It then becomes impossible to sell the crates which accumulate on the market, and are finally in one form or another disposed of to the great disappointment and loss of the grower, and to the prejudice of the entire crop. If the poorest part of the New Jersey crop, to the extent of say one-third of the whole, had been kept at home until the present time, and the greater part of this third had become worthless, I believe far more would have been realized for the crop than can now possibly be obtained.

“The stock in New York on the 1st of January instant, I believe, was not excessive—probably not exceeding 10,000 to 12,000 bushels. The mild weather has favored shipments, and the demand has been sufficient to promptly carry off the receipts of sound, well-packed fruit, at slightly improved prices, and to

reduce the old stock when made merchantable by separating and repacking.

“Reports indicate a moderate reserve in the country, which, with the increasing scarcity and advancing rates of apples, seem likely to cause some further improvement in choice cranberries, and to prevent the coming spring from proving an exception to the regular alternation of high and low prices at the end of the season so long observed.

“Roughly made or under-sized crates have continued to be a perplexity and a damage, and this evil appears to be on the increase. I feel constrained to mention that some of the largest growers have continued their former practice of using crates 5 to 10 per cent. below the standard, and others have this year, to my great surprise, followed their bad example.

“Scant measure is a mean and cowardly swindle, a covert fraud upon the purchaser, and an injustice towards the honest packer. One of the greatest merits of this association has been its systematic and persevering efforts to induce uniformity in size of packages. Great good has in this way been accomplished, but much evil remains. There are both cranberry growers and dealers of good general repute who are practically trading upon the honesty of their neighbors, and endeavoring through false appearances to realize the value of the standard measure upon a smaller quantity. The cooperage that supplies cranberry barrels for use in New York has but one customer for the standard size. All others use barrels holding about 10 per cent. less. Our Cape Cod friends use barrels with heads of same diameter and same depth as your standard, but some of their coopers are able to make the hoops bind upon a surprisingly straight stave. The New York coopers, on the contrary, are very apt to give the standard barrel more bilge than the prescribed measurement.

“The Cape Cod brand is simply those two words stenciled upon the head, which, of course, is easily copied, and I am told is often found upon smaller barrels, containing fruit grown elsewhere. I believe the Cape Cod growers begin to feel the need of some protection in what may be called their trade mark.

“The cranberry is an elastic fruit and requires tight pressing into packages, so that it may bear transport without chafing, and satisfy the customer when opened for sale. But some crops yield to pressure much less than others; hence it is practically im-

possible to prescribe any given number of unpressed quarts as the proper amount to be measured into a barrel or crate. The barrels bearing the brand of this association are $25\frac{3}{8}$ inches deep, with diameter of heads $16\frac{1}{2}$, and bilge $18\frac{3}{4}$, all inside measure. This barrel, when the fruit is pressed tight enough to bear transportation without slackening, will turn out three handsomely rounded bushels. The crates bearing the same brand are $22 \times 12 \times 8\frac{3}{8}$ inches, inside measure, and when packed with equal tightness, will turn out a rounded bushel.

“The above described barrel corresponds to the New York made, full sized apple barrel, and in all except bilge is, I think, identical with the Cape Cod cranberry barrel. These sizes were settled by a series of experiments, and I believe no good reason can be assigned for a change of capacity.

“Why then should not these sizes be made legal and all growers and dealers required by law to use them. But it is said this is a very difficult matter to fix and enforce by law—that to prescribe the capacity of packages to be used in marketing fruit interferes with the reserved rights of the citizen and might prove on trial to be unconstitutional. Is it true then that to market fruit in packages calculated to deceive (for this is what it comes to), is a privilege protected by the fundamental law? Ill considered and carelessly drawn laws in advance of, or contrary to public sentiment, frequently become dead letters or worse.

“I hope we can avoid this, and I suggest that either a Standing or a Special Committee be charged with the prompt and thorough consideration of this subject with authority to mature a suitable bill and apply in the name of this association to the Legislature for its enactment. If this be done, and wisely and effectually done, I fully believe similar enactments will soon follow in Massachusetts, and that the New Jersey cranberry barrel will ere long become the legal barrel in New York for cranberries, apples, potatoes, or whatever of produce is marketed in barrels, without the test of quantity.

“N. R. FRENCH,
“180 Reade Street, New York.”

Mr. Budd read the following on statistics of the Philadelphia trade :

“I have not been able to get as full and complete accounts of the berries shipped to or through Philadelphia as I hoped to have at this meeting. As there has been no account kept at the railroad offices in Philadelphia of the shipments over the different railroads passing through the cranberry district of New Jersey to that city, I have endeavored to get what information I could from the local stations on these roads situated in the county of Burlington and the southern part of Ocean county, supposing that the berries from the northern part of Ocean county would go to New York. Depending on the kindness of Mr. Rider to get the statistics from the counties south of Burlington, I wrote to most of the stations in the district first named, and from some I received complete reports, for which the agents of those stations will accept my thanks, and I would recommend that a copy of our proceedings as published in the Times and Journal be sent to those agents. From stations that I received no report I have endeavored to get the best information I could of parties living in the neighborhoods.

“From the county of Burlington I make the following report, which includes a few berries not yet shipped: Pemberton township, which appears to be the heaviest cranberry growing township in the county, shipped her fruit from Pemberton and New Lisbon, the greater part being shipped from Pemberton. From these two stations to Philadelphia, 17,908 bushels; to New York, 4,500 bushels. From Wrightstown to Philadelphia, 232 bushels; to New York, 5 bushels. From Cookstown to Philadelphia, 4,23 bushels; to New York 2,260 bushels. From Hornerstown to Philadelphia, 770 bushels; to New York 20 bushels. From Shamong to Philadelphia, 88 bushels; to New York, 1,267 bushels; to Trenton, 386 bushels. From the townships of Southampton, Medford, Shamong, Evesham, and Egg Harbor to or through Philadelphia, 15,400 bushels; to New York 1200 bushels, and to other places 300 bushels. Most of these berries were shipped from Vincentown, Medford and Tuckerton, and most of the remainder were carted directly to Philadelphia in wagons, as it is common to do in some parts of Medford and Shamong townships. The crop in these townships was somewhat short, owing to the light crop in Medford township, which is supposed to have been caused by the hailstorm which visited that vicinity last summer. The total amount of cranberries by

the above figures shipped or to be shipped from the county of Burlington to Philadelphia is 38,611 bushels, to New York 9,252 bushels, and to other places 1,047 bushels; a total of 48,249 bushels, nearly four-fifths of which went to or through Philadelphia.

“From Ocean county I have the following: Barnegat to Philadelphia, 346 bushels; to New York, 3,190 bushels. From Manahawkin to Philadelphia, 960 bushels; to New York, 51 bushels. Bamber to Philadelphia, 815 bushels; to New York, 95 bushels. Manchester to Philadelphia, 376 bushels; to New York, 6,090 bushels. From the stations of New Egypt, Toms River, Forked River, Waretown and West Creek I have no correct report; but from information received from persons living in those vicinities I make the amount shipped to or through Philadelphia 9,900 bushels; the amount shipped to New York I suppose to be much greater.

“From stations north of Manchester I suppose most of the fruit goes to New York, and probably not over 1,000 bushels are shipped to Philadelphia. Total berries shipped from Ocean county to Philadelphia, 12,397 bushels; and from the two counties of Burlington and Ocean, 51,008 bushels, a little over three-quarters of which came from Burlington county.

REPORT OF THE NEW JERSEY STATE HORTICULTURAL SOCIETY.

The third annual meeting of the society was held in Geological Hall, New Brunswick, February 6th and 7th, 1878.

In the absence of the President and Secretary the meeting was called to order by B. B. Hance, Corresponding Secretary, and Vice President Collins, of Moorestown, called on to preside.

Mr. Hance, Chairman of the Fruit Committee, reported as follows:

“The season of '77 was one of extremes as to moisture and dryness, yet we had a very fair crop of fruit, except apples, it being the off year, yet a limited number of varieties of these, in some sections, yielded well.

“We would further urge upon the members of the society the importance of more correspondence, and to write at the time of handling the crop, as the various effects of the season, culture

or fertilizers are then more impressed on the mind; then again, one fruitful source of reports are exhibitions, and as we failed to have any, correspondence was the more necessary.

STRAWBERRIES

Were a heavy crop, although there were complaints of leaf blight in some sections, nevertheless each grower had all he wanted to attend to, and in the central portion of the State a warm, muggy spell ripened all varieties nearly at one time, there being but five or six days' difference between the earliest and latest. Among those of the newer sorts we note as promising well, are *Forest Rose*, *Cumberland Triumph*, *Duchess*, *Prouty's Seedling* and *Sterling*.

RASPBERRIES

Did as well as could be expected from the small growth of canes produced, by reason of the drought in 1876.

We were more forcibly impressed by the great length of the raspberry season, having them in perfection for about three weeks from the same ground, commencing with the *Highland Hardy*, and following in order with *Doolittle's Black-cap*, *Miller's Daily*, *Mammoth Cluster*, *Brandywine*, *Winant*, *Philadelphia* and *Cuthbert*.
Of

BLACKBERRIES,

Wilson's Early (where it does not winter kill), *Kittatinny* and *Lawton*, or *New Rochelle*, still being the favorites.

We had the pleasure of examining a new variety last summer, on the grounds of E. T. Field, of Monmouth, called the *Peerless*. It was brought from Rochester, N. Y., ripens same time as *Wilson's Early*, a profuse bearer, partaking more or less of the *Dorchester* in flavor.

PEACHES.

Their great enemy, the yellows, appears more or less periodical and they are now enjoying a partial respite from the great pest.

There have been rapid strides in producing varieties that ripen much earlier than the old standard sorts.

Honeywell, *Amsdens June*, and *Alexander* will ripen about four weeks ahead of *Troths Early Red* which was for many years the earliest of any note.

GRAPES

Bore a bountiful crop, except in some sections there was complaint of rot. This disease appears to be wrapped in as much mystery as the pear blight, and we should like to hear as full an expression on this disease at this meeting as we had on pear blight at our last.

This fruit has received great additions as to earliness.

All the following ripen from one to two weeks ahead of *Hartford Prolific*, viz: *Danesville*, *Sherman*, *Winslow*, *Talman* and *Telegraph*.

PEARS

Are not receiving as much attention as formerly, owing to the blight, but as this disease in many sections is now on the decline and as many growers have neglected their cultivation in consequence, we would advise parties having pear orchards to put them in as good order as possible, and be ready for another series of years that they will do well, and in the meantime, the long looked for remedy may be found.

APPLES.

As far as observed the following early varieties proved profitable, many orchards ranging from fifty to one hundred barrels per acre, viz: *Primate*, *Red Astrachan*, *Benoni* and *Orange Pippin*, and among the late varieties *Pennock* or *Pelican*, *Smith's Cider* and *Gilpin* or *Carthouse*.

For the committee,

B. B. HANCE,
Chairman.

JOHN VAN DOREN, OF MANALAPAN, MONMOUTH COUNTY, REPORTED.

“I think some of my pear trees are recovering in a measure from the blight and believe that many have been saved by the knife, making two, three or four incisions in the bark on the trunk and larger limbs where the bark appeared dark and dead or dried up.”

D. MC LAURY, OF NEW BRUNSWICK.

“*Pears*.—A good crop, the blight appears to be decidedly on the decline in this neighborhood generally. I think the impression is that the best cultivated orchards are the freest from blight. I think that both apples and pears thoroughly cultivated in good soil are looking much healthier and have produced more fruit than when they have not received much attention.”

S. C. DE COU, MOORESTOWN.

“*Strawberries*—With us had immense bloom and a very heavy set of fruit, but a leaf blight set in about the time the fruit began to ripen, and although the crop was still large, it was somewhat shortened by the blight and the berries were not as fair as they otherwise would have been. *Chas. Downing*, which is largely cultivated here, was especially affected. This leaf blight seems to weaken the plant. Old beds that had fruited twice and were well set and clean before picking, have generally died out, being hastened somewhat by the heavy growth of crab-grass and other weeds.

“*Gooseberries*—Bore profusely and generally free from mildew; and the unusually cool and cloudy weather saved them from scald, but the low price (\$1 per bushel and often less) left the crop unprofitable.

“*Raspberries*—The previous dry season caused a poor growth of canes. The crop generally light, and prices low. *Philadelphia*, however, bore a fair crop, but the color is so much against it, that while *Brandywine* and other red varieties would bring 10 cents per pint, *Philadelphias* would bring but 6 and 7.

“*Cherries*—*Early Richmond* and the *Common Pie Cherry* are about the only ones cultivated here. The crop was very light,

prices low, and since the leaves have fallen the black knots show themselves in great profusion.

“*Blackberries*—Were a very good crop and fair prices prevailed throughout the fruiting season. *Wilson's Early* is generally cultivated, the best cropper we have, and freest from disease. A little double blossom is about their only affliction.

“*Apples*—The crop was generally light, but some varieties bore full crops, the most noticeable of which was *Smith's Cider*, which bore profusely. If it will continue to bear in the off year of other varieties, it will add another feature to its good reputation.

“*Pears*.—Spring brought forth a heavy bloom, but autumn showed a light crop of fruit. Slugs prevailed greatly during the summer. One orchard of *Clapp's Favorite* I noticed to be exempt from slugs, but afterwards the same orchard blighted badly. Whether the slugs stopped the growth and thereby checked the blight or not I am unable to say, but I think trees of luxuriant growth are disposed to blight.

“*Peaches*.—Not much cultivated with us, but where grown there was a fair crop of fruit.

“*Grape*.—Crop generally light.

WM. PARRY, CINNAMINSON.

“The *Pear Blight* has not been so bad with us the past year as formerly. It would seem that the height of its rage was over and that now it is on the decline.

“The *scald* on the cranberry is yet very destructive and thousands of bushels are ruined by it, though the percentage of sound berries this last fall was greater than the year previous, but we find no remedy for it yet.

C. W. IDELL, OF HOBOKEN.

“Having heard so much of the skill and success of E. W. Durand, of Irvington, New Jersey, in producing such wonderful specimens of new varieties of strawberries, and being a great admirer of beautiful fruit, I called on him on the 18th of June last, and being but slightly acquainted with him I frankly stated my object in calling, and requested him to give me a few moments of his time in showing me his fruit and offering me such information

as I might require to get at the real qualities of it. In the first place, I would state that Mr. Durand is simply an originator of new varieties. All he has are of his own growing from the seed, the merits of some of which he has been testing several years, and I frankly confess that I was surprised to see such a large number of the finest and best fruit I ever saw, and in no instance did I see a single variety that gave indications of ripening unevenly or imperfectly. They were thoroughbreds of the purest strain. The following is a description of those varieties I examined:

“*Surprise*.—A fine, vigorous grower, and wonderfully productive. Berries cone-shaped, regular in form, possessing a fine flavor, ripening to a rich crimson color.

“*Glossy Cone*.—Foliage rather scant, yet dark and healthy, and plant very hardy. Berries cone-shaped, perfectly smooth, of a rich crimson color, and, as its name indicates, it is so glossy that it looks like varnished fruit.

“It is not high flavored, but a good keeper, remaining long on the vines after ripening without decaying. Mr. D. stated that the fruit I saw had been ripe for six days, yet it was in good condition. In size it is not so large as most of the others, yet it is of a good size for marketing.

“*Durand's Favorite*.—Plants of a moderate growth and difficult of cultivation, yet when well managed will give general satisfaction to the grower. Berries of a deep, rich crimson, cone-shaped, but sometimes inclined to the wedge form, and of immense size.

“*Black Giant*.—One of his largest and most prolific berries. Color a deep rich red; very solid; flesh deeply stained, but possessing a very fine flavor; is one of his favorites.

“*Bachelor*.—A very rich, high flavored berry, of a beautiful red color, but, as a general thing, not so large as some of the others. Plants strong and vigorous, producing superb clusters of fruit.

“*Giant Queen*.—A pistillate berry, not intended for public distribution, of immense size, rather irregular in shape, yet inclined to the conical. It is very solid, and possesses a good flavor.

“*Pioneer*.—A firm, beautiful seedling, that he has tested for seven years; the earliest in his collection; a vigorous grower and very prolific, yielding a large crop of extra sized berries, of a

brilliant scarlet ; flesh slightly stained, with a fine flavor ; on account of its hardness well adapted for a northern climate.

“ *Centennial Favorite*.—A large fine-flavored berry, regular in form, of a rich scarlet color, ripening evenly and thoroughly, and retaining its flavor and solidity for days after ripening.

“ It is enough to say of it that it received the highest award for size and flavor at the Centennial Exhibition.

“ *Black Defiance*.—One of his oldest varieties. Berries of a deep red color ; flesh well stained, but possessing a high flavor. Plants showy and healthy, producing large crops of fine sized fruit.

“ *Beauty*.—A seedling of great promise and beauty, as its name indicates. He has tested it for six years. It is of large size, regular shape, deep, rich crimson color, flesh nearly white, and possessing a peculiar vinous flavor not often found in a berry. I mark this as the gem of his collection for amateurs. The fruit is solid, and retains its flavor and solidity for days after ripening. Plants large and vigorous, fruit stems strong, plants perfectly hardy and very productive.

“ *Great American*.—He thinks this one of his best seedlings. Fruit large, some of them weighing over two ounces, and measuring nine inches in circumference. Of course, this size is to be met with only occasionally ; but I measured several that were two and a half inches in diameter, and this was after his choice specimens had been picked for exhibitions. The berry is of a beautiful crimson color, fine flavored, juicy, with a moderate amount of acid. The plants are large and healthy, hardy, and very productive ; fruit stems strong, and the plant is inclined to bring up its entire crop to a large size.

“ In addition to those named above, he has about 3,000 other seedlings that he is now testing, some of which, he thinks are equal to any of his named varieties. Of course, my description of these varieties is not so full and accurate as one that MR. DURAND could give, yet it affords the reader a fair idea of what the fruit really is.

“ I would also state that MR. DURAND's soil is a dark loam, slightly mixed with sand, and very highly manured.”

The Vegetable Committee through its Chairman, Mr. Goldsmith, reported another year of little profit to growers of market

truck. 1876 will be long remembered for the scarcity of vegetables in our State, owing to the severe drought of that season, and 1877 was as remarkable for the super-abundance of the same, which in addition to the financial depression of the times, has caused almost an entire stagnation of trade in many varieties.

“Cabbages, tomatoes, turnips and many other kinds of truck have not paid the cost of growing them, low as that has been for the past year. Many persons thrown out of employment at trades, &c., have rented land and undertaken to grow truck for sale, thinking at least that they would get something to eat, but having no knowledge of the business, which is as much required for success in that employment as any other, they have generally made a miserable failure in the undertaking, and cancelled their rents and other debts by moving to other quarters.

“Your committee would call the attention of vegetable growers to the importance of obtaining good seed, for often when every other condition has been complied with, failure has resulted from seed deficient in kind or quality. An instance came to our knowledge of how well this fact is known by experienced growers, where a party raised last season over 100 pounds of celery seed of an improved kind and quality, and sold all he had to spare at \$10 per pound, much more readily than he could have sold one-half of the amount of ordinary seed at ordinary prices. Last year your committee requested the members to report to the committee any thing new that came under their observation, but as they have received nothing, it may be because those who have any facts to present prefer doing so at this meeting, and we hope they will be forthcoming.

“The Christiana melon, spoken of last year, has on trial proved unsuitable for market purposes, as it softens too soon after picking, but for family use we know of no superior.

“For the committee,

“W. H. GOLDSMITH,
“Chairman.”

From the Corresponding Secretary's report :

B. F. ERRINGTON, OF WHITING,

Writes as follows: “The efforts of Horticulturists in Ocean

county have been chiefly directed toward *Cranberry* culture. About 1849 Mr. Webb started the present system of culture, and his success was so great, many others adopted the same method.

“Large and small bogs were set out all through the county.

“For a time, large profits were realized, but the rot appeared, and although many of the bogs still give large crops, many others have, from first to last, been utter failures.

“Next in importance come *Peaches*. In about 1850, Benjamin Reed went into their cultivation very largely, commencing in the vicinity of Toms River. His orchards extended to Freehold, buying and leasing all the land he could get hold of; but his orchards have died out, and as far as I can learn there are now no very large orchards in the county.

“In the vicinity of Bricksburg, which seems at present to be the principal fruit locality, several young orchards have been started during the last few years, some of which have borne crops, and the owners say they do well.

“*Grapes* have received a considerable share of attention. They have been grown all over the county, but principally around Bricksburg.

“The first grapes were planted out there in 1869. For the first three years they did remarkably well, but since then the rot has become so prevalent that many growers are rooting up the vineyards, and nearly all seem discouraged with the prospects.

“*Pears* and *Apples* have not been grown very extensively but sufficiently to show that they do well here. The *blight* has not produced such wholesale devastation among pear trees as in some other parts of the country.

“The cases are few and isolated. The enemies of the apple seem to be gaining ground and very few precautions taken to check them.

“The codling-moth, curculio and borer, all ply their nefarious trades with very little restraint.

“*Blackberries* have met with success, but do not seem to have been cultivated very largely. About Bricksburg they were started some ten years ago, and for the first four years they did well, but after that two enemies, a borer in the Wilson, and a louse on the Kittatinny, have used up the profits.

“*Strawberries* have been cultivated quite extensively at Bricksburg for about the same length of time as blackberries, and have

been perfectly successful in all but the price, which the growers complain of as being low for the last two years."

EDWIN BEEKMAN, OF MIDDLETOWN,

Writes, "I have located three varieties of fruit in our district:

"First. The *Acker* strawberry was introduced by John Acker, of Keyport, about 16 years ago.

"Second. The *Keyport White* peach was introduced by Mr. Beers about 20 years ago. It was found in a garden at that place.

"Third. The *Morrel* grape, a seedling found by Wm. Morrel on his premises, and has fruited about two years. It is a good flavor, purple color, and ripens 10 days ahead of Hartford Prolific. The first man who cultivated fruit to any extent in this vicinity was Rev. Benjamin Bennet about 1810. He introduced the *Salisbury Pippin* and *King* apples, and *Seckel* pear. They are in good bearing condition now. Richard Leonard, of Navasink, was among the first to grow grapes for market."

J. VAN DEVENTER, OF PRINCETON,

Writes, "In your favor of 26th, you request such facts and reminiscences as I may be able to communicate in regard to the history of the State Horticultural Society, which was organized some 35 years or more ago, and after a very successful career of 10 or 12 years, closed its labors in 1853. I had no part in its organization nor did I become connected with it until some 3 years afterward.

"The late Judge Field who was its first President, I think, from its origin and until the last year of its existence, together with Thomas Hancock, H. W. S. Cleveland and Ira B. Underhill, of Burlington, John S. Chambers, Charles Scott, Gen. Perrine and others, of Trenton, Gov. Wright, J. W. Hayes and Dr. Ward, of Newark, Mr. Steele, of Jersey City, and Isaac Pullen, of Hightstown, are names I now remember as among the active, efficient members of the society.

"During its existence there were nine very successful exhibitions held at various places, mainly in West Jersey, at which liberal premiums were awarded. The exhibitions were very creditable

displays of fruits, flowers, floral designs and vegetables. The ladies of the several places contributing largely to their success by their taste and efficiency in decorating the halls.

"The exhibitions held in the vicinity of Philadelphia were attended by many of its citizens, and the 8th, which was held in Jersey City, was visited by many citizens of New York. The last and one of the best exhibitions was held in Princeton in the fall of 1852, under the Presidency of Capt. Thos. Lavender, of Princeton, one of the most useful members of the society, and was pronounced by many visitors from the neighboring cities one of the most beautiful displays they had ever seen.

"As to the causes of its dissolution. I think one of the most prominent was several important changes made in the constitution which alienated several of its most important friends and caused a number to withdraw. Another was the resignation of the Presidency by Judge Field, who had from its commencement been the mainstay of the association, which was discouraging to its few remaining active members upon whom had devolved the main labor of sustaining the society. Another cause, I think, was the too large annual charge for membership which was \$3 in later years.

"The subjects discussed were:

"*Pear culture* in its present condition as a profitable pursuit.

"*Pear blight*, results of another seasons observation.

"*Raspberry culture*, best methods and varieties.

"*Tree planting*, for shelter and the roadside, and best trees for the purpose.

"*Our small birds*, is their destruction justifiable.

"*Peach culture*, and best varieties for New Jersey.

"*Our native nuts*, their cultivation and commercial value, and *Old fashioned flowers*.

"These were discussed very generally with a great deal of interest.

"A proposition from a committee of the Burlington County Agricultural Society to hold an exhibition on their grounds at Mt. Holly, at the time of their annual fair, October 8th, 9th and 10th, was received and accepted, the details of the arrangement being left with the Executive Committee.

"The exhibit at this meeting consisted of 22 plates of apples,

9 of pears, 7 of native nuts, 1 of Florida oranges, and plants and cut flowers in good quantity.

“New Brunswick was again selected as the place of holding the next annual meeting, and the thanks of the society tendered to the local committee, the ladies and citizens who contributed so much to decorate the hall, the entertainment of the members, and the interest manifested in the labors of the society.

“E. WILLIAMS,

“*Recording Secretary.*”

APPENDIX.

The following is a partial list of Agricultural and Horticultural Societies in the State :

THE NEW JERSEY STATE AGRICULTURAL SOCIETY.

ORGANIZED 1855.

President—Hon. Amos Clark, Jr., Elizabeth.

Vice Presidents—Phineas Jones, Newark ; N. N. Halsted, Newark ; N. S. Rue, Cream Ridge ; John S. Irick, Vincentown ; E. G. Brown, Elizabeth.

Recording Secretary—William M. Force, Newark.

Corresponding Secretary—P. T. Quinn, Newark.

Treasurer—Samuel Manning, Plainfield.

Executive Committee—Wm. A. Morrell, Phineas Jones, E. G. Brown, J. B. Kilburne, Wm. Shove.

Number of Members—350.

Capital invested in Fair Grounds, Buildings, &c.—\$90,000.

Meetings of the Directors are held on the third Wednesday in June, October and January ; annual meeting of the Society, on the third Wednesday in January.

Annual exhibition, at Waverly, Essex county, third week in September, which is very largely attended. An annual report of the meetings and the exhibition is published.

NEW JERSEY CRANBERRY GROWERS' ASSOCIATION.

ORGANIZED APRIL 25, 1873.

President—Rev. Dr. John H. Brakeley, Bordentown.

Vice Presidents—James A. Fenwick, New Lisbon ; Dr. E. S. Merriman, Bricksburg.

Secretary and Treasurer—A. J. Rider, Atsion.

Executive Committee—Rev. Dr. J. H. Brakeley, Bordentown ; A. J. Rider, Atsion ; E. W. Crane, Caldwell ; N. R. French, 180 Reade street, N. Y.

Representative in State Board of Agriculture—E. W. Crane, Caldwell.

Statistician—N. R. French, 180 Reade street, N. Y.

Corresponding County Secretaries—Ocean county, Julius Foster, Bricksburg ; Burlington county, Theodore Budd, Pemberton ; Atlantic county, Robert J. Byrnes, Hammonton ; Monmouth county, Samuel Conover, Freehold ; Middlesex county, I. S. Buckelew, Jamesburg ; Camden county, Job Braddock, Haddonfield ; Cape May county, Thomas Beasley, Cape May Court House.

Number of Members—108.

The annual meetings are held at Trenton, third Wednesday in January ; and annual conventions, first Tuesday in September, at such place as selected at the annual meeting.

NEW JERSEY STATE HORTICULTURAL SOCIETY.

ORGANIZED AUGUST 17, 1875.

President—George Such, South Amboy, Middlesex county, N. J.

Vice Presidents—A. S. Fuller, Ridgewood, Bergen county ; J. S. Collins, Moorestown, Burlington county ; George M. Cole, Deerfield, Cumberland county ; J. C. Beardsley, Newark, Essex county ; C. W. Idell, Hoboken, Hudson county ; E. Allen, New Brunswick, Middlesex county ; J. Van Deventer, Princeton, Mercer county ; J. Van Doren, Manalapan, Monmouth county ; B. T. Errington, Whiting, Ocean county ; H. E. Chitty, Paterson, Passaic county ; E. Dayton, Bernardsville, Somerset county ; N. W. Parcell, Elizabeth, Union county.

Recording Secretary—E. Williams, Montclair, Essex county.

Corresponding Secretary—B. B. Hance, Red Bank, Monmouth county.

Treasurer—W. H. Goldsmith, Newark, Essex county.

Executive Committee—P. T. Quinn, Newark, Essex county ; E. Roberts, Fellowship, Burlington county ; S. C. De Cou, Moorestown, Burlington county ; Thomas Cole, Deerfield, Cumberland county ; D. McLaury, New Brunswick, Middlesex county.

Fruit Committee—B. B. Hance, Red Bank, Monmouth county ; William Parry, Cinnaminson, Burlington county ; D. McLaury, New Brunswick, Middlesex county ; C. W. Idell, Hoboken, Hudson county ; P. T. Quinn, Newark, Essex county.

Vegetable Committee—W. H. Goldsmith, Newark, Essex county ; Henry Campbell, Freehold, Monmouth county ; W. H. Denise, Freehold, Monmouth county.

Flower Committee—H. E. Chitty, Paterson, Passaic county ; George Such, South Amboy, Middlesex county ; E. S. Carman, River Edge, Bergen county.

The annual meeting is to be held in the Geological Hall of Rutgers Collge, New Brunswick, January 9th, 1879.

NEW JERSEY STATE POULTRY ASSOCIATION.

Secretary—Dennis C. Crane, Roselle, Union County.

ATLANTIC COUNTY.

EGG HARBOR CITY AGRICULTURAL SOCIETY—ORGANIZED MARCH 23, 1859.

President—Philip Steigauf, Egg Harbor City.

Vice President—Adam Veit, Egg Harbor City.

Recording Secretary—Valentine P. Hoffman, Egg Harbor City.

Treasurer—William Behns, Egg Harbor City.

Librarian—John H. Trampler.

Number of Members—67.

Meetings—First and third Fridays in each month, at the Union Hotel, Egg Harbor City.

Annual Fair—Latter part of September.

ATLANTIC COUNTY AGRICULTURAL ASSOCIATION—ORGANIZED 1874.

BAKERSVILLE AGRICULTURAL CLUB.

FRUIT GROWERS' UNION, HAMMONTON*—ORGANIZED 1868.

President—George F. Saxton, Hammonton.

Secretary—Gerry Valentine, Hammonton.

Other Officers—One Vice President and six Directors.

Number of Members—100.

BURLINGTON COUNTY.

BURLINGTON COUNTY AGRICULTURAL SOCIETY—ORGANIZED 1846.

President—Isaac Fenimore.

Vice President—Emmor Roberts.

Directors—Isaac Fenimore, Emmor Roberts, B. F. Deacon, Judson C. Gaskill, Wm. R. Hancock, Wm. S. Taylor, Joseph Wills, John B. Collins, Theodore H. Risdon, H. I. Budd, Edward L. Bowne.

Recording Secretary—John B. Collins, Mount Holly.

Corresponding Secretary—Henry I. Budd, Mount Holly.

* No report received since the last meeting.

Treasurer—Edward B. Jones, Mount Holly.

Delegate to the State Board of Agriculture—James Lippincott, Mount Holly.

Number of Members—(stockholders)—400.

Annual Meetings—Third Saturday of each January.

Annual Exhibitions—October 8, 9, 10, 1878. Held at Mount Holly, N. J.

Meetings—In the Burlington County Lyceum rooms, quarterly, viz.: on the fourth Saturday in January, April, July and October.

BURLINGTON COUNTY FARMERS' CLUB*—ORGANIZED IN 1871.

President—James Lippincott, Mount Holly.

Vice Presidents—Clayton Zelley, Joseph W. Emley, James Logan.

Secretary—Henry I. Budd, Mount Holly.

Treasurer—Edward L. Bowne.

Number of Members—80.

MOUNT LAUREL FARMERS' CLUB OF BURLINGTON COUNTY—ORGANIZED DECEMBER, 1865.

President—William Dunn Rogers, Mount Laurel.

Recording Secretary—Chalkley Stokes, Mount Laurel.

Corresponding Secretary and Treasurer—Mark H. Busby, Masonville.

Meetings—First Monday in each month, in their own hall, at Mount Laurel.

Number of Members—110.

CAMDEN COUNTY.

FARMERS' MUTUAL BENEFIT ASSOCIATION—ORGANIZED JANUARY, 1872.

President—Joseph C. Hollingshead, Haddonfield.

Vice President—Ezra C. Bell.

Recording Secretary—Amos E. Kaighn.

Corresponding Secretary—Edward Burrough, Merchantville.

Treasurer and Librarian—J. Stokes Coles.

Number of Members—35.

Meetings are held regularly, on the last Thursday of each month.

* The meetings have been irregular on account of the absorption of the members in the Grange, a list of which follows this list of Agricultural and Horticultural Societies.

CAPE MAY COUNTY.

CAPE MAY COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—ORGANIZED
MARCH, 1870.

President—G. M. Post.

Vice President—William Doolittle, Ocean View.

Secretary—W. V. L. Seigman.

Treasurer—Wm. Townsend.

The annual meeting is held the last Saturday in February, and an Exhibition in September.

CUMBERLAND COUNTY.

CUMBERLAND COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY—*ORGAN-
IZED DECEMBER 8th, 1851.

President—Charles Woodnut, Shiloh.

Vice Presidents—John S. Holmes, Dr. Samuel G. Cattell, Joseph H. Ogden,
Ephraim P. Ayres.

Secretary—Eli E. Rodgers, Bridgeton.

Treasurer—Francis Danzenbaker, Bridgeton.

Number of Members—518.

Annual Meeting—Fourth Wednesday in January.

Annual Exhibition in September. The society is in a prosperous condition.

VINELAND AGRICULTURAL SOCIETY†—ORGANIZED OCTOBER, 1862.

President—S. D. Clark, Vineland.

Recording Secretary—Richard Lush, Vineland.

Corresponding Secretary— — — — —.

Treasurer—Q. Wright, Vineland.

Librarian—William A. Jolly, Vineland.

Number of Members—75.

Meetings are held every Saturday evening; and an agricultural, horticultural and floricultural fair is held annually.

* No report of officers received since last meeting.

† No report of officers, meetings, etc., received since last annual report.

FLORAL SOCIETY, VINELAND*—ORGANIZED 1864-5.

President—Mrs. O. D. Graves, Vineland.

Vice President—Mrs. C. D. Bailey, Vineland.

Secretary—Mrs. L. D. Dyer, Vineland.

Treasurer—Mrs. W. P. Swasey, Vineland.

Number of Members—200.

Meetings weekly. The Society is strictly floral, but it unites with the Vineland Agricultural Society in their annual exhibition. A chrysanthemum show is held in the fall of each year.

SOUTHWEST VINELAND FARM AND GARDEN CLUB.

President— ——— ———.

Secretary—C. H. Lewis.

WEST VINELAND FARM AND GARDEN CLUB.

President— ——— ———.

Secretary—G. W. Lewis, Vineland.

GLOUCESTER COUNTY.

WOODBURY FARMERS' CLUB.*

President—Joseph Carter, Woodbury.

Vice President—Daniel J. Packer, Woodbury.

Secretary—Charles W. Knight, Woodbury.

Corresponding Secretary—D. Cooper Andrews, Woodbury.

Treasurer—James Budd, Woodbury.

Number of Members—30.

The meetings have been suspended for some time.

UPPER GREENWICH FARMERS' CLUB.

President— ——— ———

Secretary—Thomas D. Brown, Clarksboro'.

* No reports of officers, meetings, &c., received since last annual report.

HUNTERDON COUNTY.

HUNTERDON COUNTY AGRICULTURAL SOCIETY*—ORGANIZED FEBRUARY 16, 1856.

President—John C. Hopewell, Flemington.

Vice Presidents—Caleb F. Fisher, George F. Crater.

Recording Secretary—John L. Jones, Flemington.

Corresponding Secretary—Richard S. Kuhl, Flemington.

Number of Members—350.

Meetings of stockholders are held on the third Saturday of February, and an exhibition on the Tuesday, Wednesday and Thursday of the last week in September.

UNION FARMERS' CLUB, MOUNT AIRY.

President—Elisha E. Holcombe, Lambertville.

Vice President—Newton K. Young.

Secretary—F. S. Holcombe.

Treasurer—Gideon M. Brewer.

Number of Members—26.

MERCER COUNTY.

THE FARMERS' ASSOCIATION OF PRINCETON—ORGANIZED IN 1840.

President—Hon. James Vandeventer, Princeton.

Vice President—Hon. James H. Bruere, Princeton.

Secretary—Henry E. Hale, Princeton.

Number of Members—Limited to 20.

Meetings are held once a month, at the houses of the members.

HOPEWELL FARMERS' CLUB†—ORGANIZED DECEMBER 19, 1868.

President—Ralph Ege, Hopewell.

Vice President—Joseph M. Phillips, Hopewell.

Secretary—John M. Dalrymple, Hopewell.

Treasurer—William I. Phillips.

Number of Members—18.

Meetings are held on the first and third Wednesdays of each month.

*No report of officers and meetings received since the publication of the last annual report of this Board.

†No report of officers and meetings received this year.

MIDDLESEX COUNTY.

MIDDLESEX COUNTY FARMERS' CLUB—ORGANIZED NOVEMBER 12, 1867.

President—Jacob Christopher, New Brunswick.
Vice President—Adrian Vermeule, New Brunswick.
Recording Secretary—George H. Lambert, New Brunswick.
Treasurer—Dr. A. D. Newell, New Brunswick.
Number of Members—75.

Meetings are held the first Monday of each month.

MONMOUTH COUNTY.

MONMOUTH COUNTY AGRICULTURAL SOCIETY—ORGANIZED IN 1852.

President—Nathaniel S. Rue, Cream Ridge.
Vice Presidents—E. W. Conover, Middletown ; Joseph H. Holmes, Holmdel.
Secretary—John C. Smock, Freehold.
Corresponding Secretary—James J. Conover, Freehold.
Treasurer—C. A. Bennett, Freehold.
Number of Members—300.

Meetings are held on the third Tuesday in January, and at the time of Exhibition in September.

Annual Exhibition—Second week in September.

MONMOUTH COUNTY POULTRY ASSOCIATION*—ORGANIZED IN 1873.

President—John Van Mater, Colts Neck.
Secretary—John T. Rossell, Freehold.
Treasurer—D. A. Vanderveer, Manalapan.

Meetings are held quarterly at Freehold, at which essays on poultry are read. An exhibition is held annually, at Freehold, either in December or January. These have attracted much attention, and have done much to improve the stock of poultry in the county. They are open to competitors from all parts of the world.

OCEAN COUNTY.

OCEAN COUNTY AGRICULTURAL SOCIETY.*

President—George Cowperthwaite, Toms River.
Secretary—J. W. Carmichael, Toms River.

SALEM COUNTY.

WEST JERSEY AGRICULTURAL AND HORTICULTURAL ASSOCIATION OF THE COUNTIES OF SALEM AND GLOUCESTER, NEW JERSEY.

President—Omar Borton, Woodstown.

Vice Presidents—John W. Dickinson, Woodstown; Robert Vanmeter, Elmer Dr. M. J. Paulding, Daretown; John Hanes, Woodstown.

Secretary—J. Morgan Barnes, Woodstown.

Treasurer—Dr. L. A. D. Allen, Woodstown.

Number of Members—264.

Meetings—The annual meeting is on the third Thursday in January, and a semi-annual meeting, third Thursday of July, at Woodstown.

SOMERSET COUNTY.

SOMERSET COUNTY FARMERS' AND MANUFACTURERS' ASSOCIATION—ORGANIZED JULY 16, 1870.

President—Rynier H. Veghte, Somerville.

Vice President—Abm. T. Huff.

Secretary—William S. Potter, Somerville.

Treasurer—L. R. Vredenburg, Somerville.

Number of Stockholders—About 600.

The annual meeting of the stockholders is held on the third Saturday of February. The annual fair of the Society is held in the first week in October.

UNION COUNTY.

UNION COUNTY FARMERS' CLUB—ORGANIZED DECEMBER 11, 1868.

President—Noah W. Parcell, Union.

Vice President—E. P. Beebe, Elizabeth.

Secretary—Dennis C. Crane, Roselle.

Treasurer—Ogden Woodruff, Elizabeth.

Number of Members—35.

Meetings are held in the Court House, Elizabeth, semi-monthly, excepting in the summer. They are informal in character, and the discussions relate to general farm questions. Agricultural papers are taken, and the club has a library.

WARREN COUNTY.

WARREN COUNTY FARMERS', MECHANICS' AND MANUFACTURERS' ASSOCIATION*—
ORGANIZED 1859.

President—John V. Deshong, Belvidere.

Secretary—J. T. Kern, Belvidere.

Treasurer—Israel Harris, Belvidere.

Number of Members—60.

The annual meeting is held at Belvidere, the last Friday in December. The annual Exhibition takes place at Belvidere on the first Tuesday in October.

The interest in our Agricultural Societies and Farmers' Clubs has, to a considerable extent, been transferred to the Farmers' Granges, which have been organized in many parts of the State. The following list of Granges and officers has been sent to the Board by their secretary.

*No report received this year.

STATE GRANGE.

MASTER.	P. O. ADDRESS.	SECRETARY.	P. O. ADDRESS.
I. W. Nicholson.....	Camden, Camden county.....	John W. Dickinson.....	Woodstown, Salem county.....

SUBORDINATE GRANGES.

NO.	NAMES.	MASTER.	POST OFFICES.	COUNTIES.	SECRETARY.	POST OFFICES.	COUNTIES.
1	Pioneer	Samuel Blish	New Brunswick.....	Middlesex	N. G. Vreeland.....	New Brunswick.....	Middlesex.....
2	Marl Ridge	J. M. Bean.....	New Egypt.....	Ocean.....	F. S. Gaskill.....	New Egypt.....	Ocean.....
3	Hammoniton	Edward Howland.....	Hammoniton	Atlantic.....	R. J. Byrnes.....	Hammoniton	Atlantic.....
5	Swedesboro.....	James B. Dumphly.....	Marlton	Burlington	Freeman Hurff.....	Swedesboro.....	Burlington.....
6	Mount Laurel.....	Levi L. Walton.....	Moorestown	Burlington	Mark H. Busby.....	Masonville.....	Burlington.....
8	Moorestown	E. L. Borton.....	Woodstown	Salem.....	Sallie M. Ballinger.....	Moorestown	Burlington.....
9	Woodstown	E. G. Miller.....	Paulsboro	Glooucester	C. H. Richman.....	Woodstown	Salem.....
10	Paulsboro	D. V. L. Schenck.....	Lambertville	Hunterdon	Sallie C. Moore.....	Mickleton.....	Glooucester.....
12	Ringoes	Charles Hunt.....	Bridgeton	Hunterdon	John L. Drake.....	Lambertville	Hunterdon.....
13	Cohansey	G. W. Kirkbride	Burlington	Cumberland	E. E. Rogers.....	Bridgeton	Cumberland.....
14	Edgewood	J. C. Bowen.....	Shiloh	Burlington	R. W. Kirkbride	Burlington	Cumberland.....
16	Hopewell	C. F. Dickinson	Bridgeton	Cumberland	A. R. Jones.....	Bridgeton	Cumberland.....
17	Harmony	Morris Bacon.....	Greenwich	Cumberland	George W. Moore.....	Bridgeton	Cumberland.....
18	Cumberland	T. B. Kingsland.....	Roselle	Union.....	Josiah Bacon.....	Greenwich	Cumberland.....
19	Progress	G. M. Post.....	South Seaville.....	Union.....	H. R. Valentine.....	Union.....	Union.....
21	Seaville.....	Joel Horner.....	Palmyra	Cape May.....	Wm. Doolittle.....	Ocean View.....	Cape May.....
24	Union.....	Lippencott Coles.....	Harrisonville	Burlington	Jos. M. Kaighn.....	Camden	Camden.....
26	Harrisonville	Elmer Gaunt.....	Pittsgrove.....	Glooucester	Samuel Moon.....	Harrisonville	Glooucester.....
29	Pittsgrove	John Garrison.....	Daretown	Salem.....	Mary Curran.....	Pittsgrove.....	Salem.....
30	Franklin	C. A. Rulon.....	Swedesboro.....	Salem.....	E. Garrison.....	Daretown	Salem.....
32	Bridgeport	H. F. B. Husted.....	Fairton	Glooucester	H. S. Bright.....	Bridgeport	Glooucester.....
34	Cedarville	Albert Haines.....	Medford	Cumberland	John Rainier.....	Fairton	Camden.....
36	Medford	Caleb Clothier.....	Jobstown	Burlington	Edmund Braddock.....	Medford	Camden.....
37	Mount Holly.....	R. Lewis Shivers.....	Camden.....	Burlington	Annie H. Deacon.....	Mount Holly.....	Burlington.....
38	Haddon	Geo. W. Kugler.....	Camden.....	Camden.....	Isaac A. Braddock.....	Haddonfield	Burlington.....
39	Mantua.....	Geo. W. Johnson.....	Mantua	Camden.....	W. C. Long.....	Haddonfield	Camden.....
40	Lawrence	Asa G. Turner.....	Trenton	Glooucester	Thos. B. DeCou.....	Mantua	Glooucester.....
41	Auburn.....	Seth H. Leap.....	Auburn	Mercer.....	Edwin W. Lippincott.....	Trenton	Mercer.....
42	Penns Grove.....	F. B. Minch.....	Penns Grove.....	Salem.....	Chas. C. Barber.....	Auburn	Salem.....
43	Hope.....	Albert Dumont.....	Bridgeton	Salem.....	David J. Hitchman.....	Penns Grove.....	Salem.....
44	Branchburg	Uriah S. Borton.....	N. Branch Depot.....	Cumberland	Peter Dumont.....	Branchburg	Cumberland.....
49	Rancocas	J. C. Gaskill.....	Rancocas	Hunterdon	Nancy M. Haines.....	Branchburg	Cumberland.....
50	Pemberton	John Gaunt	Birmingham	Burlington	Henry R. Lippincott.....	Rancocas	Hunterdon.....
51	Mullica Hill	Jos. D. Coles.....	Mullica Hill	Burlington	David Borton.....	Rancocas	Burlington.....
52	Deerfield	R. M. Hitchner.....	Deerfield	Glooucester	Chas. D. Moore.....	Mullica Hill	Burlington.....
54	Palatine	John T. Cox.....	Elmer	Cumberland	Jas. Burroughs.....	Deerfield	Glooucester.....
56	Readington	John Taylor.....	Readington	Salem.....	Wm. Connet.....	Palatine.....	Cumberland.....
57	Centre Grove	Chas. DeLow.....	Millville	Hunterdon	H. C. Goslin.....	Readington	Salem.....
58	Columbus		Columbus	Cumberland	Alfred Troth.....	Millville	Hunterdon.....
				Burlington		Georgetown.....	Burlington.....

59	Woodbury.....	Josiah Budd, Jr.....	Woodbury.....	Gloucester.....	James T. Budd.....	Woodbury.....	Gloucester.....
60	Corse Landing.....	E. Atkinson.....	Woodstown.....	Salem.....	N. R. Steward.....	Sharptown.....	Salem.....
61	Crosswicks.....	Alfred Satherthwaite.....	Crosswicks.....	Burlington.....	T. F. Applegate.....	Crosswicks.....	Burlington.....
66	Millville.....	Sam'l Leatherwood.....	Millville.....	Cumberland.....	Willis Ackley.....	Millville.....	Cumberland.....
69	Glassboro.....	Hiram Stanger.....	Glassboro.....	Gloucester.....	Ira Izard.....	Glassboro.....	Gloucester.....
77	Mercer.....	A. L. Holcombe.....	Hopewell.....	Mercer.....	W. J. Phillips.....	Hopewell.....	Mercer.....
78	Wantage.....	Abiah Wilson.....	Deckertown.....	Sussex.....	Nunan Hall.....	Deckertown.....	Sussex.....
79	Hamilton.....	Theo. Cubberly.....	Hamilton Square.....	Mercer.....	Eliza Hugues.....	Hamilton Square.....	Mercer.....
80	Flemington.....	G. B. Stothoff.....	Flemington.....	Hunterdon.....	Joseph Sergeant.....	Flemington.....	Hunterdon.....
84	Bethel.....	Geo. W. Grier.....	Hurffville.....	Gloucester.....	R. Babcock.....	Hurffville.....	Gloucester.....
85	Williamstown.....	H. Porch.....	Williamstown.....	Morris.....	A. D. Budd.....	Williamstown.....	Morris.....
86	Budd's Lake.....	E. G. Budd.....	Budd's Lake.....	Cumberland.....	Sophia E. Church.....	Budd's Lake.....	Cumberland.....
87	South Vineland.....	G. W. Kilborn.....	South Vineland.....	Hunterdon.....	A. M. Carrell.....	South Vineland.....	Hunterdon.....
88	Locktown.....	H. F. Bodine.....	Locktown.....	Cumberland.....	J. Burr Woolman.....	Locktown.....	Cumberland.....
89	Tabernacle.....	J. G. Scott.....	Vincentown.....	Burlington.....	B. Tomlinson.....	Vincentown.....	Burlington.....
90	Blackwood.....	Theo. Wider.....	Blackwoodtown.....	Camden.....	D. D. Denise.....	Kirkwood.....	Camden.....
92	Monmouth.....	John Stairs, Jr.....	Colts Neck.....	Monmouth.....	A. L. Conover.....	Freehold.....	Monmouth.....
97	Clinton.....	N. G. Wyckoff.....	Clinton.....	Hunterdon.....	Henry R. Taylor.....	Clinton.....	Hunterdon.....
98	Albion.....	Albert K. Elle.....	Albion.....	Monmouth.....	D. A. Stairs.....	Albion.....	Monmouth.....
99	Holmdel.....	L. G. Schenck.....	Holmdel.....	Atlantic.....	Sam'l D. Bancroft.....	Holmdel.....	Monmouth.....
100	Pine Grove.....	Geo. Kempton.....	Hammonctown.....	Hunterdon.....	T. S. Guillard.....	Kingwood.....	Hunterdon.....
101	Sergeantsville.....	John B. Fisher.....	Sergeantsville.....	Monmouth.....	David M. Bird.....	Tinton Falls.....	Monmouth.....
102	Eatontown.....	Wash. L. Hope.....	Shrewsbury.....	Hunterdon.....		Pittstown.....	Hunterdon.....
103	Pittstown.....	John G. Bond.....	Pittstown.....	Hunterdon.....			



TABLE OF CONTENTS.

	PAGES.
Annual Meeting.....	1-2
Spring Meeting.....	2-10
Commercial Fertilizers.....	10-17
Analyses of Fertilizers.....	13-16
Shell or Calcareous Marl.....	17-50
Origin and General Notes.....	17-19
Description of Localities.....	19-36
Williams Farm, Sussex county.....	19
Black Creek Meadow, Vernon township.....	19-20
Roe Pond, Sussex county.....	20
Roe's Meadows, Sussex county.....	20-21
Lane's Pond, Sussex county.....	21
White Pond, Sussex county.....	21-22
Paulinskill Meadow, Sussex county.....	22
Drake Pond, Sussex county.....	22-23
Pike, or White Pond, Sussex county.....	23-24
Decker's Pond, Sussex county.....	24-25
Reding's Pond, Sussex county.....	25-26
J. H. Ayres' Meadows, Sussex county.....	26
Long Pond, Jacob Vass' farm, Sussex county.....	26
Sink Pond, Sussex county.....	26-27
Hazen Pond, Warren county.....	27
Grass Pond, Warren county.....	27
Cook Pond, Warren county.....	27-28
A. W. Cooke's farm, Warren county.....	28
Glover's Pond, Warren county.....	28
Luse Pond, Warren county.....	28
Long Pond, Frelinghuysen township, Warren county.....	29
Hope Meadows, Warren county.....	29
Cook's, or Reed Pond, Warren county.....	29-30
Mt. Herman, Warren county.....	30
Carter's Meadows, Blairstown, Warren county.....	30
White Pond, Warren county.....	31-32
Mud and Shuster Ponds, Warren county.....	32
Catfish Pond, Sussex county.....	32
Isaac Bonnel's Meadows, Sussex county.....	32-33
J. Cole's Meadows, Sussex county.....	33
James Bevans' Meadows, Sussex county.....	33
Layton's Meadow, Centreville, Sussex county.....	33-34
Bevans and Smith Meadow, Sussex county.....	34

	PAGES.
Calcareous Tufa—Travertin.....	34-36
B. P. Van Syckel's Marl, Sussex county.....	35
Mettler's farm Marl, Sussex county.....	35-36
Letters on the use of Shell Marls.....	36-47
H. S. Cook	36-37
Isaac Bonnel.....	38
J. S. Carpenter.....	38-39
William Campbell.....	39
E. H. Wright.....	39
George H. Beatty.....	39-40
S. R. White.....	40
James A. Goodale.....	40-41
Joseph Ayres.....	41
Theodore F. Young.....	42
A. M. Cooke.....	42
P. W. Squier.....	42-43
Jesse G. Roe.....	43
B. P. Van Syckel	43-44
Francis Layton.....	44
George W. Drake.....	44
John F. Winslow.....	45-47
General Observations on the Use and Value of Shell Marls.....	47-50
Greensand Marls.....	50-54
Marlborough Marls, Monmouth county.....	50-53
Fostertown and South Branch Marl Company.....	53
Dr. Theo. T. Price on use of Marls.....	53-54
On the products of General Farming, Sweet Potato Growing, Dairying and the Cultivation of Peaches and Apples.....	55
State Agricultural College Farm, Middlesex county.....	55-57
Martin J. Ryerson, Passaic county.....	58-59
Anthony L. Day, Passaic county.....	59-63
Silas Cummins, Warren county.....	63
Jacob H. Cramer, Morris county.....	63-65
Jacob Flomerfelt, Morris county.....	65-66
John T. Leigh, Hunterdon county.....	66-67
Abm. T. Huff, Somerset county.....	67-69
Lawrence Van Derveer, Somerset county.....	69-70
James Neilson, Middlesex county.....	70-74
John F. Phillips, Mercer county.....	74-76
William A. Hough, Mercer county.....	76
Michael Taylor, Monmouth county.....	76-79
Isaac G. Smock, Monmouth county.....	79
John T. Woodward, Monmouth county.....	80
Wm. A. Newell, Monmouth county.....	80-83
Isaac A. Van Hise, Ocean county.....	83-85
A. S. Mac Beon, Ocean county.....	85-87
William Parry, Burlington county.....	87-88
Van Buren Griffin, Camden county.....	88-90
Andrew K. Hay, Camden county.....	91

	PAGES.
R. J. Byrnes, Atlantic county.....	91-93
Valentine P. Hoffman, Atlantic county.....	93-94
Wm. O. H. Gwynneth, Cumberland county.....	94-97
James Abbott, Salem county.....	97-98
Wm. P. Coles, Salem county.....	98
Sweet Potato Growing and its Diseases.....	98-111
Woodbury Grange, Gloucester county.....	98-107
J. G. Whitall, Woodbury, Gloucester county.....	107-108
Wm. Doolittle, Cape May county.....	108-111
On the Growth of Swine.....	111-116
Burlington County Swine.....	111-116
Monmouth County Swine.....	116
Dairy Farming.....	117-128
Daniel Bailey, Sussex county.....	117-119
Oscar Dunn, Sussex county.....	119
Jacob B. Leport, Sussex county.....	120-121
N. W. Parcell, Union county.....	121-123
John Crane, Union county.....	123-124
Jonathan Townley, Union county.....	124
E. C. Nichols, Union county.....	125
J. C. Baker, Union county.....	125
An Orange County, N. Y. Dairy.....	126-128
Peach Growing in Hunterdon County.....	128
Thomas C. Haward.....	128
Cultivation of Apples.....	130
Stacy P. Conover, Monmouth county.....	131
Wm. H. Grant, Monmouth county.....	130-2
Frank Pettit, Salem county.....	132-4
Sugar Beets and the Manufacture of Beet Sugar.....	134
Introduction.....	134
Joseph Wharton's Statements.....	135
Extract on the Cultivation of the Sugar Beet.....	145-149
Cranberry Growers' Association Meetings.....	149
Report of N. R. French.....	149-159
Report of the New Jersey State Horticultural Society.....	161-172
Appendix—	
List of Agricultural and Horticultural Societies.....	173-182
New Jersey State Grange and Subordinates.....	184-185

UNIVERSITY OF ILLINOIS-URBANA



3 0112 112110736